SERVICE MANUAL
FOR
UNITED PRESS INTERNATIONAL
PICTURE TRANSMITTER
TYPE 16-S-DF/2
S/N 704 AND UP

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NEW YORK, NEW YORK

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SPECIFICATIONS

A. FIXED

Drum Dimensions:

Diameter	-	3.25 inches
Length	-	8-9/16 inches
Maximum Picture Size	-	8 in. x 10 in. - Standard
Power Source	-	100-125v., 200-250v., 50-60 Hz
Line Connections	-	2 wire or 4 wire
Power Consumption Standby	-	3 VA
Transmit	-	35 VA
Dimensions Machine	-	11 x 14 x 5 in.x27.94x35.56x12.7 CM
Carrying Case	-	13.5 x 16.5 x 6.75 inches 34.29 x 41.91 x 17.14 CM
Weight - In Carrying Case	-	23.5 lbs. (10.65 kg)

B. SELECTED

	1	2	3	4	5	6
Index of Co-operation	352	352	352	352	440	440
Lines/Inch	108	108	108	108	135	135
Drum Speed RPM +	60RH	120RH	60RH	120RH	120LH	120LH
Picture Time Mins.+	14.4	7.2	14.4	7.2	9	9
Line Signal *	FM	FM	AM1	AM1	AM2	FM
Output Signal - DBM	0	0	0	0	-3	0
Phasing Pulse	Wht	Wht	Wht	Wht	Blk	Blk

* FM - 1500 Hz White, 2304 Hz Black
AM1- Double Side Band, Adjustable Carrier Frequency
1300 to 1900 Hz, Preset at 1800 Hz
reflectance-linear wedge, max. amplitude - White
AM2- (UPI Domestic Standards) Vestigial Upper Side Band, 2448 Hz
Synchronous Carrier, Modified Density-Linear Wedge, Max. Amplitude - White

\+ With Multiplier Switch (PC 200) in times"2"(240) position, multiply Drum Speed R.P.M. by 2, divide Picture time by 2.

SECTION 1 - GENERAL DESCRIPTION

Before reading this description, it is recommended that the technician familiarize himself with all operating controls explained in the Operating Instructions. See Fig. A.

1-1. LOCATION OF ELEMENTS

Fig. A shows in block fashion the electronic and mechanical elements of the system and their principal location in the sub-systems. Fig. A. can be further divided as follows: Part A consists of PC-601 , PC-200 plus all elements drawn above those boards. Part B consists of all elements drawn below PC-601 and PC-200. . Part A is shown schematically in Fig. 18; Part B in Fig. 19. The figures are arranged in this manual so that they can simultaneously be folded out to present the entire electronic chassis in one view. The PC-601 and PC-200 boards are mechanically joined by Connector J203. PC-601 serves as a mother board for plug-in control board PC-602. . In Fig. A, all elements above PC-601 and PC-200 , except PC-602 ., are found in the main frame of the scanner (Fig. 6). The PC-601 -200 boards are mounted on the rear of the main frame partition plate. All elements below PC-601 and PC-200 are found on the hinged rear frame of the scanner (Fig. 5).

1-2. MECHANICAL

The copy drum is rotated, through compliant coupling, by a slow speed synchronous motor; no gearing is used. The optical carriage is moved on its rails parallel to the drum axis by a lead screw engaged against a fixed threaded member (half-nut) on the carriage. Stowing provision allow both the drum and optical carriage to be snugged against the machine frame during transportation. The lead screw and a torsion clutch are driven by a stepping motor and gear reduction in such a manner that rotation of the motor in one direction (forward) causes the lead screw to bear against the half nut and provide normal traverse. Rotation of the stepping motor in the opposite direction (reverse) causes the lead screw to swing away from the half-nut and permits the carriage to return to starting position by influence of the carriage return spring (Fig. 2).

1-3. OPTICAL CARRIAGE

The optical carriage includes two exciter lamps, objective lenses, picture element aperture, electron multiplier photo cell, picture signal amplifier PC-100 and limits contactors at start and finish of traverse. The picture signal amplifier (photo cell amplifier) contains amplitude shaping circuits and provides DC amplification to output levels suitable for both the AM and FM modulators. The optical carriage is electrically connected to PC-601 board via flexible tape cable and plug.

1-4. AUTOMATIC BACKGROUND CONTROL, HIGH VOLTAGE SUPPLY

When AUTOMATIC WHITE setting is active, the picture signal amplifier output from PC-100 is compared to a voltage from the stabilized reference source and error signal is delivered to the dynode high voltage generator and regulator. This is the automatic background control (ABC).

1-4. AUTOMATIC BACKGROUND CONTROL, HIGH VOLTAGE SUPPLY (Cont'd).

High voltage to the photo-multiplier dynodes is reduced by the error signal, thus reducing photo multiplier gain until maximum picture signal voltage (white) is reduced to correct value. The stabilized reference source also provides black and white modulation levels, as selected through the FUNCTION switch or automatic (digital) control system, in all conditions except picture scanning. The pulse shaping squares the chopper output and provides black pulse or white pulse keying to the stabilized reference source in PULSES function.

1-5. CHOPPER

Photo-electric shopper PC-500 and a mask mounted on the picture drum provide pulses of 27^{0}centered on the copy clamp interval of the drum rotation. The chopper shares electrical plug connection to PC-601 board with the two limits contractors.

1-6. FAIL SAFE/FEATURES

"Run sense" provides a signal to RESET in the AUTOMATIC function when the drum fails to rotate. Likewise, the "start" limit switch signals RESET if the optical carriage fails to start traverse in AUTOMATIC function. Contacting of the "finish" limit switch will signal RESET any time the drum is rotating; for example, at the end of traverse, carriage return failure or operator attempt to "send" in MANUAL-PICTURE position of FUNCTION switch.

1-7. OSCILLATOR, BUFFER-MODULATOR

The FM Generator-AM Oscillator consists of two integrated circuits. In I.S.FM modes, the oscillator frequency is controlled by either the stabilized reference source or the picture signal. Front panel calibration is provided utilizing highly stable reference frequencies from PC-200 whose dividers are properly altered by the FUNCTION switch in BLACK and WHITE positions. Calibration is sensed by audible beat from the monitor speaker. In I.S. AM modes, the oscillator serves as a carrier source whose frequency is adjusted by a bias control. In domestic mode, the oscillator is locked (synchronous) at 2448 Hz by coupling to the synch motors frequency division system.

1-8. FILTERING

The output of the FM buffer-AM modulator, being essentially square wave, requires filtering. The signal filtering section in I.S. modes serves as a low-pass filter providing near sinusoidal output from the scanner. In domestic mode, the filter is switched to provide vestigial upper side band characteristics, thus permitting the higher base-band frequencies.

1-9. LINE AMPLIFIER

The line amplifier provides power gain and impedance matching to hybrid section PC-402.

1-10. CRYSTAL OSCILLATOR

The temperature-compensated crystal oscillator (part of PC-200) provides a highly stable source of frequency suitable, through division, for all synchronous requirements of the scanner.

1-11. INTEGRATED CIRCUITS AND RELAYS

Frequency dividers on PC-200, IC1, 3, 6 and 7 provide all the clock rates for operation of the drum and stepping motors. IC6, 7 switches all clock rates for 60 or 120 RPM modes. IC6 switches the leadscrew system clock rate for 352 and 440 index of co-operation (I.S. or domestic, respectively). IC4 provides 4-phase drive for the drum motor transistors. IC5 provides 4-phase drive for the leadscrew motor transistors.

IC4 controls reversal of the drum motor by inverting one phase, i.e. right hand for I.S. modes, left hand for domestic. IC5 circuits provide for reversal of L.S. motor by inverting one phase, i.e. forward rotation for optical carriage traverse, reverse rotation for leadscrew disengage.

1-12. MODE AND FUNCTION SWITCHES

Control board PC 602 supports the MODE and FUNCTION switches. The MODE switch interconnects all system elements for the selected mode of operation, such as type of modulation, speed, index of co-operation, program for automatic function, etc. The FUNCTION switch activites the appropriate circuits for the function selected. In the first four positions (BLACK, WHITE, LIMITS and PULSES), the modulator (as selected by the MODE switch) is keyed to black or white state by the stabilized reference source.

In LIMITS position, the reference source is connected to a fixed frequency multivibrator situated on the PC-602 control board and provides five seconds each alternate black and white keying. In PULSES position, power is applied to the scanner motors. Chopper output, through the pulse shaper, then provides the keying to the reference source. In PULSES position, the high voltage dynode supply and automatic background (white)control are also made operative.

In PICTURE position, the picture amplifier replaces the stabilized reference source as the modulating signal and leadscrew motor is switched to "forward" operation. In the above description, all MANUAL functions are only realized if the SEND button has been depressed and illuminated.

In AUTOMATIC position of the FUNCTION switch, it is only necessary to depress the SEND button or encode the scanner remotely. In this position, the digital program control provides the circuit switching in accordance with one of two preset timing sequences, as follows:

All I.S. Modes: 64 sec. White-32 Sec. white pulses-PICTURE

Domestic mode: 64 sec. black pulses-8 sec. pause-PICTURE

1-13. TIMING

Timing is accomplished by utilizing the chopper-pulse output as a clock in a binary counting system. Gates and transistors connected to binary stage outputs provide switching at selected counts.

1-14. TELEPHONE FACILITY

The hybrid system PC-402 and switching provide for 2-wire or 4-wire telephone facility connection to scanner output, monitor input and handset circuits. With the 2-wire connection, attenuation of transmitted signals by the hybrid system permits monitoring for return signals.

The monitor amplifier-speaker PC-401, is conventional. The handset receiver requires no power from the machine; the microphone requires power-ON for talk capability.

1-15. REMOTE CAPABILITY

The remote sent-reset unit PC-403 consists of a limiter amplifier, FM detector and reed drive amplifier. Three reeds and circuits perform three-tone sequential decoding to provide addressed remote SEND capability. A fourth reed provides a single tone (frequency common to all machines) remote RESET capability.

1-16. POWER SUPPLY

The Power Supply PC-300 and T-300 transformer assembly permit 115 or 230-volt, 50-60 Hz main operation. A Hi-Lo primary tap switch permits normal operation with mains below 110 or 220 volts down to 95 or 190 volts, respectively. Two secondary rectifier and filter systems handle all power requirements of the machine. Two regulator systems on these sources provide a +5 volt and +12.5 volt supply. These regulators are switches on by depression of the SEND button or remote encoding and are switched off by depression of RESET button or remote signal. Utilization of DC power at the filters provide for standby operation of the monitor amplifier, tone decoder and handset with only the POWER switch ON.

SECTION 2 - THEORY OF OPERATION

2-1. PHOTOCELL AMPLIFIER

(Refer to the PC-100 portion of Fig. 18)

This printed circuit is mounted on the optical carriage. It is connected to main frame circuits via flexible tape cable CLB-101, whose end has been processed into a plug suitable for insertion into Jack J-2 on the PC-601 board. The tape cable conducts 5-volt regulated power (less R-73 voltage drop) for the pre-wired in-series exciter lamps I-101A and B on the front of the optical unit. The cable also conducts high voltage to the dynode resistor string in J-101. The 931A electron multiplier photocell plugs directly into J-101; the photocell amplifier is driven by output from the final dynode at pin 10 via the white lead.

This circuit can be broken up into four sections, Pre-Amp, Tone Comp.IN (T.C. IN), Tone Comp. OUT (T.C. OUT), and Output Amplifier.

Pre-Amp Circuit

This section consists of IC-1 (308H) and its associated components. IC-1 is a precision low drift high input resistance operational amplifier. It is used to buffer, invert and amplify the photomultiplier output. The amplifiers output (Pin 6) is equal to reference voltage (Pin 3) of 3.1 volts, when no or black level input is applied, and 8 to 10 volts when white level is viewed. Pin 6 is brought out to a test point called "White Slope" (W. SL.).

Tone Comp. Out Circuit

This sectior consists of Operational Amplifier IC3-14 and its associated components. (IC-3 and 2 both have four operational amplifiers and they are identified by their output pin). Pin-12 of IC-3 is connected to the 6.2 volt reference source, R-14 equals R-13, therefore this amplifier stage has a gain of "1" and inverts the signal. (Example: 9.2 volts white input equals 3.2 volts output, 3.1 volts black input equals 9.4 volts output).

Tone Comp. In Section

This section consists of IC2-1, 7, 8 and IC3-7, 8. These amplifiers do the same inverting function as amplifier IC3-14 in the T.C.OUT Section, but where IC3-14 gives an inverted linear function output (multiplies by "1"), the T.C. IN Section modifies the picture curve. The curve is broken up into three basic segments as follows: (input located at T.P. W. SL.) white area--7 to 9 volts, grey area--4 to 7 volts, and the black area--3 to 4 volts.

Amplifier IC2-7 is active in the white area, amplifier IC2-8 is active in the grey area, and amplifier IC2-1 is active in the black area. The preset voltage on the plus (+) input pin of each amplifier determines the point where each amplifier starts to control its area of the picture curve. These three stages are output buffered by IC3-7. In addition to the above mentioned three primary amplifiers, IC3-8 amplifier is connected in parallel and is called white boost. With a set gain of 1.47, the "+" input is adjusted so that this stage takes over from 8 to 9 volts input (W. SL.). D1, D2, D3, D4, D5 are steering diodes thereby allowing each amplifier section to take over at the assigned level. The picture curve is modified as follows:

Area	Control Amp.	Gain Control	Gain
White Boost Area	IC 3-8	--	1.47
White Area	IC 2-7	RV 2	<1
Grey Area	IC 2-8	--	1.2
Black Area	IC 2-1	RV 1	>2

Output Amplifier

This section consists of IC 3-1 and its associated components. This operational amplifier multiplies the input by .85 and inverts the signal. The output is a low impedance driver circuit. RV-6 is adjusted so that black level (T.C. OUT) is 1 volt output.

Additional Functions

Relay K1 is energized in T.C.OUT position thereby its swinger disconnects IC 3-7 and 8 outputs from the output stage, and connects IC 3-14 (T.C. OUT) to the output stage. D 7, R 25, 26, 27 make up an on-board precision voltage reference source of +6.2V and 3.1 volts.

2-2. AUTOMATIC BACKGROUND CONTROL

(Refer to the PC 601 and PC 200 section of Fig. 18).

2-2. AUTOMATIC BACKGROUND CONTROL (Cont'd.)

The automatic background system (ABC) senses the peak white output level of the picture amplifier and uses this information to set the photocell dynode voltage value. This makes the maximum white signal a direct function of the drop across the 6.0 V zener reference element; D3 on the PC-601 board. This zener becomes the control standard, thereby assuring a constant output for white regardless of the absolute perceived density of the "white" on a given page.

The ABC consist of IC9, and associated components. Pins 5 and 6 of IC9 are the differential input of an operational amplifier 4. One input is connected to photomultiplier board output through K1-5. (Note: Function will be identified by output pin, etc: AMP4.) The other input is connected to the reference diode (6V-D3). Upon starting, the high voltage section supplies maximum voltage (-550V) to the photomultiplier tube. Under this condition, will give maximum output (over 6V). The high voltage section will then reduce its voltage linearly; the output of the photocell board will be reduced proportionately. Once the output (photocell board) has reached 6 volts, IC9 AMP8 output will change from 1 volt to 6 volts signifying the photocell has reached proper operating level. This output is connected to the IC11 and inhibits further voltage reduction.

The actual output of the high voltage section is controlled by the center tap of T1. This voltage is determined by IC9-AMP 12. The inputs to this amplifier are pins 12 and 14. Pin 13 is connected to a constant voltage source. Input pin 14 is connected to resistor network R49-60. The output voltage is the inverse of difference between the resistor network voltage and the constant voltage source. IC10 is a binary counter. IC11 is a square wave generator whose output is on pin 3 and is connected to pin 10 of IC10. These pulses are counted by the binary counter. Upon start of the program, all output of IC10 are at zero (resistor network voltage at minimum), therefore IC9-AMP12 and the high voltage are at maximum voltage. As IC10 counts the pulses and the corresponding outputs change from "0" to "1", the resistor network voltage rises thereby lowering the high voltage output. When the 6 volt "stop" signal is received from IC9-AMP4, the generator (IC11) stops and IC10 remains in its last state. This is the correct state for proper "white level" output.

2-3. HIGH VOLTAGE POWER SUPPLY

(Refer to the PC-601 portion of Fig. 18.)

The high-voltage supply for the multiplier photocell photo cathode and dynode-electron multiplier voltage divider is basically a medium-frequency power amplifier coupled through a step-up transformer to a voltage-doubling rectifier and a resistance-capacity filter.

2-3. HIGH VOLTAGE POWER SUPPLY (Cont'd.)

The bases of the two transistors Q-5 and Q-6 are driven in push-pull by a 4896 Hz square wave signal from a flip-flop stage of IC-203 in the frequency divider circuit. Signal swing, from a small fraction of a volt (positive)up to a few volts (positive) goes alternately to each base, so the grounded-emitter transistors are driven through the isolating 2.7k base resistors R-42, 43 from off to hard-on in chopper fashion.

Collector power for the transistors is supplied from the ABC circuit as explained in Sec. 2-2. Since the voltage of the collector supply is controlled by the peak white of the copy, the special power transformer primary is actually fed with 4896 Hz square wave whose amplitude is determined by the effective white of the copy.

The secondary of the special transformer provides a step-up of the primary voltage. Taps are provided so that the maximum possible output voltage can be selected. The selected transformer tap connects to the center tap of the 6DD16B high voltage rectifier D-9 which is connected in a conventional common-ground voltage doubler circuit. This is followed by the RC filter consisting of four .5 mfd 500-volt capacitors C-10 thru C-13 (in series pairs for a 1000-volt rating) and R-44.

The square-wave 4896 Hz signal results in a ripple-free direct current output with relatively small filter components. In addition to feeding the photocell dynodes and photo cathode, a small amount of the output is used to provide a negative bias in the ABC circuit described earlier.

2-4. STABILIZED REFERENCE SOURCE

(Refer to the PC-601 board on Fig. 18)

Since this system provides substitute modulating levels, (6.0V for white, 1.0V for black) the 6.0VDC zener diode D-3 on PC-601 which regulates the automatic background control is used as the stabilized reference source. Zener current is supplied through 360 OHM resistor R-18. The output of this section is from IC-9 AMP 10 (function will be identified by output pin) and goes through R38 to K-1 pin 5. Note that this swinger engages pin 6 (picture amplifier output) when K-1 is energized. Reference diode D3 is connected to pin 9 (IC9), one of the inputs to amplifier 10. The output is the reference voltage output. Pin 8, the other input, operates as a switch, when the voltage through D11 is less than 6.0V, the amplifier acts as a voltage follower. The output is thus 6.0V; the same as the reference diode. When the voltage on D6 is above 6.0VDC, the operational amplifier becomes an inverting amplifier. F.O.T. R35 is adjusted for an output of 1 volt for this condition. Operational amplifier (3) of IC9, is used to switch output reference level via D6. Input pin 1 is the logic input, therefore when given a high (2.5V to 5.0V) reference white (6.0VDC) is the output (pin 10); when given a low input(1.8 or less), reference black (1.0V) is the output.

2-5. CARRIER OSCILLATOR - FM MODULATOR

(Refer to the PC-602 portion of Fig. 18).

IC3, NE566, is a voltage control oscillator. Capacitor C5 controls the mid-frequency. The voltage control is pin 5. Picture signal comes from K-1 pin 6 (601) and traces through FM white variable resistor R3. Signal goes through R11 to mode switch deck 4A-1,2 where it is paralleled with a black reference level from R2 (FM-blk control). This point is connected to pin 5 (IC3), the voltage frequency control input. The frequency output is an inverse function of the control voltage. In I.S. modes IC3 pin 5 is connected through mode switch 4A-3,4 to AM carrier pot (R1). This adjusts the AM carrier frequency. In Domestic Mode AM carrier is a 2448 synchronous carrier from IC211.

2-6. AM MODULATOR

(Refer to the PC-602 portion of Fig. 18).

IC1 (XR205) is the AM modulator. Carrier is presented on pins 5-6, and video information on pin 3. Carrier frequency is a-c coupled and comes from IC3 in I.S. modes and in domestic mode it comes from IC211 on the 200A board. Video information from pin 7 (K1) is divided down by R32-R29 for proper level into pin 3 of 1C1. The output is a function of the voltage on pin 3 minus the voltage at pin 4 times the carrier voltage. The voltage on pin 4 is adjustable by R21 and is adjusted for correct picture wedge.

2-7. SIGNAL FILTERING AND LINE AMPLIFIER

(Refer to the PC-601 and PC-602 portions of Fig. 18)

The output of the IC1, pin 11 is connected to the input of the filter system. This filter is a dual function low-pass unit. In domestic mode it attenuates the 2448 Hz carrier frequency with respect to a lower frequency band. The attenuation slope is such that the requirements for low distortion vestigal sideband (VSB) are met with a relatively simple network. The VSB characteristics of the filter prevail when MODE switch section 4B position 5 shunts .1 mfd capacitor PC-602 C-1 to ground. Tracing the path through connector pin 29 of J-3 to PC-601 shows that capacitor C-5D (the .022 mfd output shunt capacity of the filter in vestigial function) is now grounded. In positions 1 through 4 (I.S. modes) of MS4B these two capacitors are in series to ground, resulting in approximately .020-mfd output shunt capacity in the filter. The filter now acts only as a low-pass system with cutoff at approximately 2600 Hz.

In all modes, the harmonics present in the square-wave output of transformer T-1 are substantially attenuated by the filter, providing essentially sinusoidal output. Note that this filter is a type which ideally is terminated in infinite impedance. In practice, the load of more than 50K presented by PC-602 R-4 and R-12 is great enough to permit the filter to perform properly.

2-7. SIGNAL FILTERING AND LINE AMPLIFIER (Cont'd).

The filter feeds Darlington emitter-follower operational amplifier IC2 (602) through the 50K output control R-4. R-12 limits attenuation of output level to about -15 DBM. The amplifier is used to achieve a very high input resistance so as not to unduly load the filter.

The T-pad R-22, R-23, R-24 provides a path for the emitter-follower emitter (Q2) current and permits a degree of isolation from possible subsequent load variations. The 0.1 mfd capacitor C-1 across the 200-ohm resistor R-23 in the T-pad attenuates the small residual third harmonic in the carrier left by the filter.

Capacitor C-9 isolates DC. R-25 maintains ground potential on C-9 output when relay K-2 is open. Relay K-2 contacts are always closed except during an 8-second interval in automatic domestic programming. Output from the amplifier and local ground are conducted by white-red and white-black leads, respectively, in cables to the hybrid system on the rear section of the scanner.

2-8. CHOPPER, PULSE SHAPER & SENSING

(Refer to the PC-500 & PC-601 portions of Fig. 18.)

Light from lamp I-500 (a 28 volt lamp operated at 12.5 volts) is interrupted for 27^{o} by a drum-mounted mask in its path to the photo diode D-500. When light strikes the diode, forward bias through R-500 is removed from the base of transistor Q-500 and its collector-emitter circuit is open.

With light interrupted, the gate of Q-500 becomes forward biased and its collector-emitter conducts. The collector connects through cable and J-1 of PC-601A to the input of "one shot 1" IC2. The output of IC2-pin 7 applies the pulse to run the automatic program control. (Through Q7). Pin 7 is also connected to pin 11, the input of "one shot 2' of IC2. This section acts as a missing pulse detector.

As long as pulses are present, Q2 output (pin 9) stays low. If the drum stops, pulses will stop and pin 9 will go high. Through NAND gate 6 in IC8, the reset line will be pulled low and the machine reset. This NAND gate is enabled through NAND gate 8 (IC3) from function switch 2A-6.

Run "1" line is controlled by Q8 and time constant R-13-C3 through inverter gate IC3-11.Upon start of transmitter Run "1" line is in zero state. This state resets all counters (IC4,5) and starts drum motor in 60 RPM mode. This is accomplished through NAND gate 7 on IC1,it's output controls the speed control line. A high state for 60 RPM drum speed, and a low state for 120 RPM speed. The other input to the NAND gate 6 of IC1, controls the drum speed by mode switch deck 2A.

2-9. FAILSAFE RESET SYSTEMS (Refer to PC 601)

There are three reset systems incorporated. The first one, "run 1" reset is described in section 2-8. This system guarantees that the drum is rotating. The system is inoperative in all manual positions of the function switch. In automatic position 6, the system is operative. The second system indicates and resets when the optical unit has fully traversed (end of picture). NAND gate 4 on IC8 grounds the reset line when: 1) the unit has fully traversed and the finish limit contactor is grounding the input inverter gate 4 (IC7), 2) when "Run 1" line is in a "one" state. This same logic provides failsafe features when: 1) SEND is instituted in PULSES position and the lead screw does not run in reverse due to electrical or mechanical failure, 2) operator attempts to start a transmission in the PICTURES position, as this position normally results in forward rotation of the lead screw. 3) failure of the lead screw to run in reverse prevents the disengagement of the half nut on the optical carriage, consequently the carriage cannot be brought to the start position by the return spring and finish limit contact remains closed.

Reset by the start limit contacts (third system) is accomplished by NAND gate 3 IC8 grounding the reset line to give this function; 1) the carriage must remain on the start limit contact, 2) logic gate (pin 8 of IC-3) must go to zero state. (Both signals go through inverting gates on IC7). Normally, this zero state occurs 4 seconds after the digital program has set the lead screw in forward rotation, starting carriage traverse after 2 to 3 seconds of traverse,the starter limit contact should open. If the contact is still grounded after 4 seconds (for example, during forward lead screw drive failure), then NAND gate 3 will reset the machine.

2-10. CRYSTAL OSCILLATOR - FM CALIBRATOR

(Refer to the PC-200 portion of Fig. 18)

TXCO is the temperature-controlled crystal oscillator unit which includes its own circuitry. Its high frequency of 5.01600 MHz. is optimum for maximum stability without temperature control, (1 part per million from 0^{o} to 50^{o}C). Screwdriver adjustment is provided for long term ageing recalibration, which should only be done with a known highly accurate frequency counter.

All digital integrated circuits used in the divider circuits of this circuit are the TTL type and all operate at +5 volt supply. IC-10 binary state input (a) pin 14, its output (A) connects to second binary state input (b). Inter-connection of binary stages B, C and D is internal. Overall division is 16:1, the output D at pin 11 is therefore 313.350 KHz. This output is conducted to a divider off the PC-200 board for further division but also to another divider system on the board which is programmed for FM calibration and domestic carrier use.

IC-9 and IC-8 are both type 7493 4-bit counters, as described above. Use is made of Ro terminals, pins 2 and 3, to alter division of these counters. When one or both Ro terminals are at logical 0 state (near ground potential), count proceeds. When both Ro terminals are at logical 1 state (near +5 volt potential), all 4 outputs reset to or hold at logical 0 state. Each counter has a hold/count transistor Q-10 and Q-11 whose collectors are normally near ground potential due to forward bias on their bases; their respective counters are thus operative. The first binary stage (a-A) of IC-9 is not used; input is at (b), pin 1, and the normal 3-stage division is 8:1. The junction of diode D-9 anode and resistor R-22 is switched to +5 volt supply by contact 1 (BLACK signal) of FUNCTION switch section 3A open circuit at position 2 (WHITE signal) and to +12.5 volts by contact 5 of the mode switch, section 5B.

Capacitor C-9 differentiates negative going output from binary stage D (when all 3 binaries are going to 0 logic at eight count). This negative impulse reverse biases Q-10 base for a period of time determined by the RC time constant of C-10, R-28 and R-20. Q-10 collector and the Ro terminals of IC- 9 assume logical 1 status and all outputs remain at 0 logic for this time constant. In this manner, IC-9 "ignores" three input counts after each 8th count, effectively becoming a divide-by-eleven system. This is the case during (WHITE signal) transmission. When +5 volts is applied through diode D-13 to R-19 during (BLACK signal) transmission, forward bias of Q-10 base is enhanced. This overcomes the negative impulse and normal divide-by-eight operation is then provided.

The second divider for FM calibration, IC-8, uses all four stages and is, therefore, basically a divide-by-16 unit. Its count is modified as above, but in both signal positions. In WHITE signal position C-10, R-25 and R-23 form the time constant that adds 3 counts to every 16 for a net division of 19. In BLACK signal position +5 volts is applied through R-22affecting the time constant so that 1 count is added to every 16 for net division of 17. In Domestic mode +12.5 volts is applied to the junction, counts are not added in this mode. The products of the two counters are thus:

BLACK	8 x 17 = 136
WHITE	11 x 19 = 209
DOMESTIC	8 x 16 = 128

The reference frequencies developed and available at IC-8 pin 12 are:

BLACK -	313.350KHz ÷ 136 = 2304Hz
WHITE -	313.350KHz ÷ 209 = 1499.28Hz
DOMESTIC -	313.350KHz ÷ 128 = 2448Hz

These frequencies, while not the conventional 2300 Hz and 1500 Hz, are within practical limits and, more importantly, are reliable. The 2448Hz is a syncronous carrier.

The reference frequency, through R-26 and the FM signal oscillator output through PC 601 R-26 are mixed in the base of Q- 9. R-29 is the mixer collector load and R-27 attenuates the output delivered to the monitor amplifier for calibration by audible beat.

2-11. SYNCHRONOUS FREQUENCY DIVISION

(Refer to PC-200 portion of Fig. 18)

The purpose of this portion of PC-200 is to provide synchronous motor drives to the Leadscrew and drum motors. This section consists of IC 2, 4, 5, 6, 7 and 10 and their associated circuitry. Synchronous frequencies are derived from IC-10 through the Speed Multiplier Switch S-1. In the 240 (2X) position, IC 6-1 receives 626,700 Hz and IC 7 receives 5,013,600Hz via Buffer IC 2-2. In the 120 (X1) position, IC 6-1 receives 313,350 Hz and IC 7 receives 2,506,800 Hz. S1 in the "X2" position will multiply drum rotation speeds by two in all modes (Example: 120→240, 60→120). In normal operation this switch will always be in the X1 position. IC 6 is a programmable divided by "N" integrated circuit. Its output, Pin 23, is the Leadscrew Motor Driver frequency as shown in the chart.

		LEADSCREW FREQ. MULTIPLIER SW	
MODE	N	X1	X2
1, 3	3626	86.43Hz	172,84Hz
2, 4	1813	172.84Hz	345.68Hz
5, 6	2224	140.89Hz	281.78Hz

Programming of IC 6 is accomplished on Pins 22, 13 via gate 10 of IC 2 ("SC"), and Pins 10, 20 via gate 6 of IC 2. Speed change shows the associated "N" (divide) numbers:

MODE	"SC" LINE	R/I LINE	N
1	1	1	3626
2	0	1	1813
3	1	1	3626
4	0	1	1813
5, 6	0	0	2224

IC 7 is a programmable divide by "N" integrated circuit. The output is on Pin 23 and is the drum motor drive frequency output on Pin 23. Programming of IC 7 is accomplished directly on Pin 6 and on Pin 3, 14 via gate 4 of IC 2. The following chart shows the associated "N" (divide) numbers and drum motor frequency.

MODE	"SC" LINE	N	DRUM MOTOR FREQ. MULTIPLIER SW.	
			X1	X2
1, 3	1	12534	200	400
2,4,5,6	0	6267	100	200

IC-4 (DU-4) is the four phase leadscrew motor driver. The input, Pin 20, receives the Leadscrew Driver frequency from IC 6--Pin 23. The four phase outputs are found on Pins 11, 12, 13 and 14. These outputs are square waves and equal to the input frequency divided by 4.

Pin 19 is the forward/reverse control input. This control allows the leadscrew motor to reverse. With an "0" input, the leadscrew is pulled out disengaging the optical unit. When a "1" is applied the leadscrew motor reverses and the leadscrew engages thereby driving the optical unit forward.

IC 5 (DU-4) is the 4 phase drum motor driver. As with IC 4, Pin 19 is the forward/reverse input. In this case, the direction of the drum motor is controlled (R/I Lines). An "0" (R/I Line) for Domestic Rotation and an "1" for I.S. rotation. Input, Pin 20, is the drum motor frequency from IC 7. It is buffered by gate 8 of IC 2. The four outputs representing the four phases are on Pins 11, 12, 13, 14. They are square waves and are equal to the input frequency divided by 4.

2-12. DRUM MOTOR DRIVER AMPLIFIER

(Refer to the PC-200 part of Figure 18).

The four outputs, Pin 11, 12, 13, 14 of IC 7 are connected through R9, 2, 3, 4 to Q4, Q1, Q3 and Q2. The outputs are all square waves with levels ≈ +5v and ≈ zero. When five volts is present the associated transistor will go into saturation, thereby grounding the collector. One of the four motor windings are connected through its associated diode (D1, D2, D3, D4) to the collector. The other side of all the motor coils are connected together and to the power supply through R 33, 34. Each time a collector is grounded current flows in that coil and the motor advances one step. D 1, 2, 3, 4 prevents negative transients from reaching the collectors. Capacitors C1, C2, C3, C4 tune the circuit to the motor.

2-13. LEAD SCREW DRIVER - AMPLIFIER

(See 2-12 for circuit operation.)

2-14. SWITCHING, MANUAL OPERATION

(Refer to the PC-602 and PC-601 portions of Fig. 18)

NOTE: Switch contacts are identified as follows:

Prefix FS = FUNCTION Switch

Prefix MS = MODE Switch

Numerals 1 through 6 = wafer section (from knob end)

Letter A or B = A or B side of wafer (See Fig. 17)

Succeeding numerals = contact position

2-14. SWITCHING, MANUAL OPERATION CONT'D.

A. Function Switch

FS1A and FS1B, positions 2 through 6, double switch +12.5 volt supply to the ABC system (Sec. 2-2) and H.V. dynode supply (Sec. 2-3). Switching between 4 (PULSES) and 5 (PICTURE) is done without interruption (shorting-type switch). Switch position 6 (AUTOMATIC) provides a double overlap of wipers and rings.

FS2A, positions 1 through 5, (MANUAL) set the wiper near +5 volts, through R-23. FS2A wiper, when positive, disables three "automatic" systems: drum rotation fail-safe (Sec. 2-9); digital program control (Sec. 2-15) and remote send-reset (Sec. 2-17). FS2A wiper, position 6, (AUTOMATIC) grounds the wiper (by overlap and rings through FS2B permitting the above circuits to function.

FS2B position 5, (PICTURE) grounds (energizes) relay K-1 on PC-601, which simultaneously:

1) transfers the modulator in use from the reference source (Sec. 2-4) to the picture amplifier output and,
2) inverts the lead screw rotation to "forward" for picture scanning (Sec. 2-13).

FS2B, position 6, overlaps with FS2A, described above.

FS3A, positions 1 and 2, switch +5 volt operating power to the FM calibrator (Sec. 2-10) during BLACK or WHITE transmission when carrier is in FM mode.

FS3B, wiper, selects keying signals for the stabilized reference source (Sec. 2-4) thereby determining which signal level the reference source provides to the modulator in use. FS3B, positions 1 through 6, are as follows:

1) 0 voltage produces black reference modulation.

2) +5 volts produces white reference modulation.

3) Alternate 0 and positive signal (5 seconds each) from the 5 sec. limits mult. to produce alternate black and white reference modulation.

4) White pulse or black pulse (27^{0} positive or 27^{0} zero, respectively) as selected by MS1A, produces reference modulation accordingly.

5) Signal remains at 0 voltage, but this is not significant as the picture amplifier has replaced the reference source as the modulation source. (See Part A FS2B-5 above.)

6) (AUTOMATIC) Same as Position 4 above except that the positive intervals are conducted through diode D-2. This permits positive voltage through R-22 to override "pulses" and provide white reference modulation during the 64-second white interval of I.S. programming (see part B, M3B positions 1 through 4 below).

2-14. SWITCHING, MANUAL OPERATIONS (CONT'D.)

B. Mode Switch

MS1A,position 1 through 4, select white pulse for I.S.Mode. Positions 5 and 6, select black pulse for domestic mode.

MS1B, positions 1,2,3,4, and 6 connect oscillator IC3 to modulator. IC1, position 5 connects 2448 oscillator (200 board) to modulator.

MS2A, positions 1 and 3, ground speed control line in 60 RPM modes. (Sec.2-11). Positions 2,4,5, and 6 supply a ground which maintains drum motor supply voltage at maximum in 120 RPM modes (Sec.2.12)

MS2B, positions 1 and 3, ground (to logical 0) a gate input of the digital program control which bypasses an input binary stage in 60 RPM modes (Sec. 2-15). Positions 5 and 6 grounds the terminal (SW GRD) on PC-200 which simultaneously switches index of co-operation from 352 to 400 (Sec. 2-11), and drum rotation from right-hand (I.S.) to left-hand (domestic), (Sec. 2-12)

MS3A, position 1 through 4, connect a 32-second timing count to logic circuits in I.S. Modes. Position 5 and 6 connects an 8-second timing count to logic circuits in domestic mode (Sec.2-15)

MS3B, positions 1 through 4, connect a timing count which is positive (logical 1) for an initial 64-seconds of automatic (I.S.) programming to R-22 (see Part A, FS3B-6 above). Position 5 and 6 connects the 64-second count to logic circuit for automatic domestic programming (Sec.2-15).

MS4A, wiper, connects the carrier oscillator to the required frequency control source for the particular mode of operation. Switch positions function as follows:

1 and 2) FM white (deviation) control R-3.

3 and 4) AM Carrier frequency adjust R-1.

5) 2448 Hz synchronous carrier in domestic mode (Sec.2-5).

6) FM White (deviation) control R-3.

MS4B, positions 1,2,3,4, and 6 ground a circuit through S-3 to 0 activate a compensation "out" relay on PC-100 (Sec.2-1). Position 5 modifies the signal filter characteristic for vestigial sideband operation in domestic mode (Sec. 2-7)

2-14. SWITCHING, MANUAL OPERATIONS (CONT'D.)

MS5A, wiper, connects the AM modulator - FM buffer to the required level control source for the particular mode of operation. Switch positions function as follows:

1, 2, and 6) FM level adjust R-5.

3, and 4) Modulating source K-1 through attenuating resistors R-15.

5) Modulating source K-1 through R32 (Sec. 2-6)

MS5B, position 5, supplies 12 volts to 2448 osc. on the 200 . board.

Switch S-3 permits compensated half-tone operation in any of the I.S. modes.

2-15. AUTOMATIC PROGRAM CONTROL

(Refer to the PC-601 portion of Fig. 18).

With the FUNCTION switch in AUTOMATIC, transmission is effected by depressing the SEND button or encoding the scanner remotely. in AUTOMATIC, the digital program control provides the circuit switching in accordance with one of two preset timing sequences, as follows:

All I.S. Modes:

64 sec. white - 32 sec. white pulses - PICTURE

Domestic Mode:

64 sec. black pulses - 8 sec. pause - PICTURE

(In FM position) 64 sec. white pulses - 8 sec. pause - PICTURE

At end of transmission the system resets to standby in any mode.

Timing of the programs is based on counting of pulses from the collector of Q-1. These are at drum rotation rates of 1 per second or 2 per second for 60 or 120 RPM respectively. The counting is done by two identical 4-bit binary counters IC-4 and IC-5. Outputs of the binaries are indicated as A, B, C, and D. Externally available clock inputs are designated as lower case a and b. The B to c and C to d clock connections are internal. The two Ro inputs at pins 2 and 3 of each unit reset and hold all binary outputs to logical 0 when they both are at logical 1. When either or both Ro inputs are at logical 0, normal count may proceed. Ro inputs can only be switched to logical 0 in automatic position. Function switch FS2A-1 through 5, inhibits operation in any of the MANUAL function positions. In FS2A-6 position, Ro inputs are low, when "Run line"

is high (see section 2-8). This provides time for all binary outputs of IC1 and IC2 to be preset at logical 0 before counting.

The pulse at the collector of Q1 connects to binary (a) input, pin 14 of IC5, and an input, pin 3 of gate 6, of the triple 3-input NAND gate IC6. In this description the output pin number designates the gate number, ie: gate 6 above. Also note that a logical 0 at any input of an NAND gate produces a logical 1 at its output. The output of binary A, pin 12 of IC5, is 1/2 pulse rate and is connected to input pin 1 and 2 of gate 12. Input 13 of gate 12 is at logical 1 state (through R-75 to the +5 volt supply) in 120 RPM modes, and logical 0 state (by grounding of contacts FS2B 1 and 3) in 60 RPM modes. Gate 12 therefore provides a steady logical 1 in 60 RPM modes and 1/2 pulse rate in 120 RPM modes to input pin 4 of gate 6. Input pins 5 of gate 6 remains at logical 1 from gate 8 throughout the programming count. Input pin 3 has, as mentioned above, pulse rate applied to it. A logic diagram will show that with pulse rate applied to one input of gate 6 and 1/2 pulse rate applied to another input, the input is at 1/2 pulse rate. Since logical 1 status is substituted for the 1/2 pulse rate in 60 RPM modes, the output of gate 6 is always 1 pulse per second. This is the counting clock rate conducted to (b), input pin 1 of IC5. The binary outputs of the counters in this description will be identified by the time, in seconds from start fo count (all outputs at logical 0) to first occurrence of logical 1 at its output. Counter IC5:B) 1 sec.; C) 2 sec.; D) 4 sec. Counter IC-1:A) 8 sec.; B) 16 sec.; C) 32 Sec.; D) 64 sec.

In the 16-S-D/F scanner the 4,8,32, and 64 second outputs are used for programming.

A. I.S. Modes.

Output reed relay K-2 is always energized because of R10 (Connected to +5) gives a high to IC7 gate 6. This through IC3 gate 6 and 3 energized K-2. IC6 gate 8, pin 11 input, and IC7 gate 4 are connected by MS3A 1 through 4 to the 32 second binary output (IC4 pin 8). IC6 gate 8, pin 10 and IC7 gate 2, are connected through PC-602 plug contacts 20 and 32 to the 64 sec. binary output, pin 11 IC4. Gate 8 pin 9 input, connects to the 4 sec. binary output, pin 11 of IC5.

At the outset, when SEND is initiated, all binary output are preset to Zero, therfore all gate 8 inputs are at logic zero. Relay K -1 is de-energized (reference source modulates, lead screw motor runs in reverse, ABC system is active.) The output of IC7 gate 2 is a positive voltage because of resistor R9 connected to +5 volt source. This positive voltage connects through MS3B1 through 4 R22 and FS3B-6, keeping the reference source at white level.

Drum rotation signals run 1 condition and count commences. After 64 seconds (of white transmission) IC6 gate 8 pin 10 and input to IC7 gate 2, go to 1. The gate 2 output removes the positive potential from R22 on PC-602 . White pulse through diode D-2 now key the reference source.

After an additional 32 seconds (of white pulses transmission) IC6 gate 8 input 11 goes to logic 1. (Note: the first occurrance of 32 seconds logic 1, without the 64 counts, has no operational effect.) With IC8 gate 3's inputs high, K1 is energized (picture amplifier modulates, lead screw motor runs forward, ABC system holds stabilized operating level).

After an additional 4 seconds, (100 sec total) gate 8 IC6 pin 9, also goes to logic 1 and gate 8 output goes to zero state. Gate 6 output then holds at 1. Without clock pulses from gate 6, the counters hold the 100 second status till end of transmission.

B. Domestic Mode. (AM or FM)

Gate 8, pin 10 IC6, and gate 2, pin 1 IC7 are connected to the 64 second binary output pin 11 of IC4. IC7 gate 2 output joins IC7 gate 6 input through MS3B5 to the 8 second binary output, pin 12 of IC4. Gate 8 pin 9 input connects to the 4 second binary output pin 11 of IC5.

At the outset when SEND is initiated all binary outputs are preset to logic state zero, therefore all gate 8 (IC6) inputs are at zero. Relay K-1 is de-energized (providing same conditions as are in I.S. mode). IC3 gate 6 is at logic state zero so that reed relay K-2 is energized (scanner signal output circuit connected). Keying of reference voltage is from black pulse output from IC2-6, or white pulse output from IC2-13 through diode D-2 on PC-602

Drum rotation signals the run 1 condition and count commences. After 64 seconds (of DOM black or FM white pulse transmission) gate 8 (IC6) pin 10 and IC7 gate 2 pin 1 will go to logic 1. Relay K-2 opens the signal output circuit, (for 8 second pause). After 8 seconds (72 seconds total) gate 8 pin 11 input will go to logic state 1. Relay K-1 becomes energized (with results described in I.S. mode). After additional 4 seconds (76 seconds total) the counters hold (by logic described in I.S. mode). Reset occurs at the end of transmissions or if a remote reset signal is received.

2-16 MONITOR AMPLIFIER-SPEAKER

(Refer to the PC-401, PC-403, and PC-300 portion of Fig. 19, and the PC-202 and PC-300 portions of Fig. 18.)

Input to the monitor is through transformer T-1. Sensitivity of the system is such that any input level down to approximately-35 DBM will give adequate monitor volume and enough level to produce limiting in the decoder amplifier system.

Secondary of T-1 feeds an emitter-follower base input (pin 10) of A-1 on PC-401, a CA3020 integrated-circuit amplifier. Output of the emitter follower (pin 1) drives the voltage-amplifier input to S-1 through VOLUME control R-1 and the input of A-1 on PC-403, a type FU741 intergrated-circuit amplifier. Output form the

voltage and power amplifier section of A-1 is coupled through push-pull transformer T-2 to the voice coil of the monitor speaker. An output level of over 0.5 watt assures more than sufficient volume from the speaker.

An input from the FM calibrator of PC-200 is brought to the junction of C-5 and R-5, from where it is treated as any input signal. C-2 and C-3 are bypass capacitors required for internal operation of the IC. R-4 provides forward bias for the emitter-follower base input. R-3 is a self-biasing resistor in the emitters of the push-pull output transistors in the I.C. Diode D-1 prevents excessive negative input to the I.C. C-4 attenuates excessive high frequency in the output. PC-4-1 serves as a plug terminal for connections to PC-4-3 and PC-402. Power for voltage amplifier circuits of the CA3020 I.C. and all of PC-403 is provided through resistor R-316 and regulated by 12-volt zener D-307, both on the PC-300 board. Power to the center tap of the output transformer T-2 and resistor R-6 (which supplied handset microphone power), both on PC-401 is from the unregulated +10 volt supply of PC-300.

Since the monitor and decoder systems must be kept on alert during standby intervals in AUTOMATIC function, power is taken from the main power supply ahead of the systems regulator which is disabled during standby. The non-critical power from the low-voltage rectifier-filter system where the level may be anywhere within the range of 8.8 volts to 11.6 volts.

2-17 REMOTE SEND-RESET

(Refer to the PC-403 and PC-300 portions of Fig.19)

Signal from the monitor amplifier is connected through C-1 and R-27 to input terminal 2 of A-1 on PC-403. Gain of the amplifier is so high that under all normal line signal conditions the amplifier is overloaded and functions as a signal limiter for the frequency-modulated encoder signals.

The amplitude-limited output from pin 6 of A-1 is connected to the input of LC resonant network C-3 and L-2 which functions as a filter-slope frequency discriminator. This means that the constant-level frequency-modulated signal produces an output from the network whose amplitude is a function of the frequency of the input signal. The effectively amplitude-modulated output of the network is fed through a transformer to a full-wave rectifier-detector and a low-pass carrier-elimination filter L-1 and C-4.

2-17. REMOTE SEND-RESET (Cont'd)

The detected autocall signals which consist of sequences of audio tones are fed through the silicon diode D-3 to the input base of Q-13, the D16P1 Darlington amplifier. The forward voltage drop of the diode in series with the two base-emitter drops of the compound transistor provide a threshold which prevents spurious signals below a predetermined level from activating the amplifier. Normal deviation signals are of sufficient amplitude to drive the amplifier to saturation so the output developed across the 510-ohm collector-load resistor R-8 is at a constant level. The signals which are approximately square waves are coupled through C-5 to the four resonant reed-tone selectors of the decoder system, whose drive coils are in series. The drive frequencies (13 tones) all lie in the octave 400 to 800 Hz. The highest tone 788.5 Hz is common reset frequency for all machines and a resonant read of the frequency in used at position RDR for single tone reset control, Twelve other tones, the lowest at 410.8 Hz are assigned letters A through M with I omitted.

If a machine's code were FAL, for example, reeds of the frequencies corresponding to those letters would be placed in sockets RD-1, RD-2 and RD-3. A reed of 410.8 Hz would be placed in RD-2 socket since that is the frequency of letter "A". The three tones are sent in sequential order, each tone lasting 0.6 seconds, or 1.8 seconds for the three.

Current through reed output coils 1,2,and 3 connect to, and provide forward bias to Q-1, Q-4, and Q-7 in that order. If the first tone excites RD-1 negative peaks at Q-1 base create positive pulses at Q-2 base and capacitor C-7 charges negatively through R-12. The resulting forward bias on PNP transistor Q-3 will last for about 0.5 second after cessation of the first tone. Positive voltage for possible forward biasing of Q-5, through R-15 will last only that long. If the second tone then excites RD-2, the same effect applies through identical circuits to the collector of Q-6 and R-19. If the third tone then excites RD-3, positive pulses through D-6 charge C-9, Q-8 becomes forward biased and its collector switches the base of Q-304 (on PC-300) to ground potential. This has the same effect as depressing the SEND button. When RDR reed is excited by 788.5 Hz (reset tone), negative peaks at Q-9 base create positive pulses at its collector that charge capacitor C-10 through diode D-7. Q-10 becomes forward biased and its collector grounds a circuit on the PC-300 board that controls reset. With the FUNCTION switch in MANUAL, Q-11 and Q-12 are forward biased by positive voltage, and their collectors then shunt any possible forward bias of Q-8 and Q-10, inhibiting remote operation.

2-18. 2 WIRE - 4 WIRE SWITCHING, HANDSET

(Refer to the PC-402 and PC-401 portions of Fig. 19)

Switch S-1 in 4W position provides isolated connection of GO and RET jacks to transformers T-1 and T-2 respectively. Both transformers have grounded shields isolating line windings. Padding resistors R-1 and R-2 make each termination 600 ohms. In 2W position the inside pair of jacks serve as line terminations; connections of the two transformer windings are in hybrid arrangement. R-3 provides the attenuating signal path to input transformer T-2.

Switch S-2 transfers T-1 primary from signal output leads (wht-red and wht-blk) to the handset microphone circuit, simultaneously connecting the microphone power source, R-6 (on PC-401) zener diode D-1 and peak-clipper-breakdown diodes "B". A third switch which connects the handset receiver in TALK position is jumped out in the 16-S-D/F. A pushbutton in the handset activates the microphone circuit. Output of T-2 is cable connected to the monitor amplifier.

With S-2 in TALK position, the receiver can not be started if in RESET condition. To start, move S-2 to PICTURE position and depress SEND button.

2-19. POWER SUPPLY

(Refer to the PC-300 portions of Fig. 19)

The dual-identical tapped primaries of T-300 are switched for high line or low line tap by switch S-302 and for series (240 volt) or parelled (120 volt) operation by S-301. Both mains supply leads are fused. A third wire in power cable 303 conducts chassis ground. The tapped secondary of T-300 provide two sources of full-wave center tap rectified and filtered DC power, as follows: 9.0 to 12.5 volts from diodes and capacitor D-300,D-301,and C-300 (identified as +10V on schematics); and, 18 to 25 volts from diodes and capacitors D-302, D-303 and C-301A and C-301B (identified as +22 V on schematics). These two sources are available when POWER switch (S-300) is ON.

The +22 volt source supplies the +12.5 volt regulator system, powers the drum motor through Dallington-connected transistors Q-310 and Q-307 (Sec. 2-12) and provides standby power to monitor and decoder circuits (through Q-310 regulated by zener diode D-307) at +13 volts. The +22 volt supply also powers the part of the SEND-RESET control circuit through R-311 and R-308.

The 10 volt source supplies the +5 volt regulator system and also supplies the switching transistor Q-311 to power the lead screw motor, handset microphone, and monitor amplifier-speaker. The +10 volt supply also powers the part of the SEND-RESET control circuit through R-308 and R-309, and powers three relays on the PC-601 -200- boards.

Q-309 is the series regulator and "off" switch for the +12.5 volt regulated supply. It is controlled by Darlington-connected Q-309. The regulating feedback loop is from output (+12.5 volts) through divider (R-313, voltage adjustment potentiometer R-314 and R-315) to base of high-gain transistor Q-306, whose emitter voltage is stabilized by 6.8 volt zener diode D-306. Inverted control voltage from Q-306 collector feeds back to Q-305 base. Note that when Q-304 base is forward biased, Q-305 base is grounded through Q-304 collector and the +12.5 volt supply is off. The same description fits components of the +5 volt regulating system except that its voltage adjustment is via potentiometer R-303 in the regulated divider to Q-301 emitter. Note that when the +12.5 volt regulator is off, regulation at the base of Q-300 is at ground potential, therefore the +5 volt supply is also off.

With supplies off, circuit conditions are as follows: Input to R-306 is 0 volts. Q-304 is open, therefore relay K-300 is de-energized (open) and SEND (here shown as TRANS) button lamp I-303 is extinguished. Base of Q-303 is forward biased (holding supplies off).

When the SEND button is depressed the emitter of Q-303 is momentarily grounded (R-309 limits excessive collector current); forward bias of Q-304 base is removed permitting the base of Q-305 to rise. Both 12.5 volt and 5 volt supplies are activated. The supplies would also be activated with the scanner set at AUTOMATIC when Q-304 base is shunted to ground by the collector of Q-8 on PC-403 upon receiving its three-tone-encoded signal. When the +12.5 volt supply comes on, Q-302 becomes forward biased, K-300 energizes (closes), and SEND button lamp I-303 lights. Contacts of K-300 ground the base of Q-303 thereby maintaining the RESET button lamp I-304 extinguished and the base of Q-304 at ground potential.

When the RESET button is depressed the emitter of Q-302 is momentarily grounded (R-307 limits excessive collector current) and K-300 contacts open. Q-303 becomes forward biased, illuminating RESET button l amp I-304 and forward biasing the base of Q-304. Removing the 12.5 volt supply results in loss of forward bias to Q-302, thereby maintaining SEND button lamp I-303 extinguished and K-300 relay contacts open. This condition would also result from grounding of Q-302 base by any collector of the three reset transistors on the PC-601 board (Sec. 2-9) or by the collector of Q-10 on PC-403 upon receiving a reset signal while in AUTOMATIC operation.

When primary power is switched on, the send-reset control system should normally assume the Reset condition because of the inertia of relay K-300. This is further augmented, in AUTOMATIC operation, by charging of capacitor C-10 (on PC-403) which momentarily forward biases reset transistor Q-10.

The 12 z volt source supplies the monitor amplifier-speaker and the Send-Reset Board (PC-403). D-309 controls the voltage and Q-312 delivers the current.

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SECTION THREE-CALIBRATION AND ADJUSTMENTS

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NOTES:

A - All voltages are read with the transmitter ON (Green "SEND" button lit.)

B - To measure voltages use a Digital Voltmeter.

C - Most Adjustments are made with the scanner in standard service position, described in Section 4-2 of service manual.

3-1 12.5 VOLT SUPPLY

A. Factory calibrated.

3-2 5 VOLT SUPPLY

A. Place scanner in service position. Locate board PC 300.

B. Adjust R-303 to obtain 5.0 volts between ground and the emitter of Q-308.

3-3 PICTURE WEDGE

(Refer to PC-601 and PC-100 portions, Figures 13 and 13B of the service manual for the following adjustments.)

EQUIPMENT REQUIRED:

DBM Meter
4-digit Digital Voltmeter
Calibrated Test Chart

A. Absolute Black Adjustment:

1. Disconect motors from PC-200 (J201, J202).

2. Place machine in service position. Locate boards PC-100 and PC-601.

3. Set function switch to "Black", mode switch to mode "3", Tone Comp Switch to "OUT".

4. With a 4-digit Digital Voltmeter, connect negative lead to ground (D-11 anode side PC-601) and the positive lead to PC 601-R-28 T.P.

5. Push "SEND" button.

6. Adjust RV-6, PC-100 to obtain 1.00 volt D.C. reading at R-28 T.P. Reset the machine after the reading is obtained.

B. Black Output Level Adjustment

1. With the optical unit looking at "WHITE" on test chart, function switch in "PULSES", tone comp switch in "OUT" position, mode switch in mode "3", push "SEND" button and wait for voltage (T.P. R-28) to drop to 6 volt D.C. $\pm$ .1 volt from approximately 7 volts.

2. Place function switch in "PICTURE" and adjust RV-4 PC-603 for "0" db reading at output jacks.

3. Rotate drum on graduated black strip on test chart, so that optical unit sees a 1.7 relative density. (1.100 volt D.C., T.P. R-28, PC-601).

4. Adjust Rv-21 on PC-602 for minus 34 dbm reading. (dbm meter connected to output jacks and terminated either through its own or external 600 ohm load. Reference white equals 0 dbm)

C. Start level adjustments

1. Set function switch to "BLACK", then remove the optical unit but leave the cable in. With optical unit face down locate R-17 (PC-100). Place the "PLUS" lead of the voltmeter on T.P. G ST on PC-100.

2. Attach a resistance decade box across the terminals at R-17, push "SEND" button and adjust resistance on the box for a 5.26 volt D.C. reading. Solder in proper resistor at R-17.

3. Place the positive lead of the voltmeter on T.P. W ST PC-100, press "SEND" button and adjust RV-3 for a 5.43 D.C. volt reading.

4. Place the positive lead of the voltmeter on T.P. B ST PC-100, and adjust RV-5 for 4.33 D.C. volt reading.

D. White Slope Adjustment

1. Place optical unit back into the machine, set function switch to "PULSES", mode switch to "5", Tone Comp switch to "IN".

2. Turn RV-2 and RV-4, PC-100 fully clockwise.

3. Connect positive lead of meter to W SL Test Point PC-100. Optical unit viewing "WHITE on Test Chart.

4. Push "SEND" button and adjust RV-2, PC-100 slowly counter-clockwise for a reading of 9.1 $\pm$ .1 volt after voltage stabilizes.

NOTE: This voltage will start at 11 volt D.C. and once it starts dropping, it will drop very fast. MAKE THIS ADJUSTMENT VERY SLOWLY. If reading goes below 9.1 volts, machine must be reset and then start step 4 again (Turn POT fully clockwise and start over).

E. White Boost Adjustment

1. With the optical unit looking at "WHITE", mode switch in "5", function switch in "PULSES", push "SEND" button.

2. Once the voltage is stabilized to 9.1 volts at W SL, adjust RV-4, PC-100, until 8.3 volt D.C. $\pm$ .1 volt reading is obtained, then reset machine. Push "SEND" button and observe if voltage drops to 8.3 volts. If not, turn RV-4 clockwise a few turns and readjust to 8.3 volts D.C.

F. Domestic Wedge Adjustment

1. Set machine controls to "PULSES' and mode switch to "5".

2. With the optical unit still looking at "WHITE", press "SEND" button and adjust "AM OUT" control on PC-602 for a -3.0 dbm reading on db meter.

3. Once white slope (W SL) is stable move the function switch from "PULSES" to "PICTURE". Rotate the drum so that optical unit sees a 2.1 relative density on a calibrated test chart.

4. Adjust RV-1 (PC-100) for a reading of 23 db on meter.

3-4 SUBSTITUTE BLACK

A. Place scanner in service position. Locate board PC-601.

B. Set function switch to "BLACK", mode switch to 3 or 4, with tone comp in "IN" position.

C. Connect db meter to output terminated into 600 ohm load. Press "SEND" button.

D. Clip R-35, PC-601 and attach resistance decade box in it's place. Adjust decade box for -36 db output on meter. Install proper value resistor at R-35.

3-5 FM BLACK

A. Place scanner in normal operating position. Locate PC-603 board.

B. Set function switch to "BLACK", mode switch to 1 or 2, 2W-4W switch to 2W. Push "SEND" button. PIC-TALK switch to TALK and speaker monitor VOL to maximum.

C. Adjust the FM BLACK (2300 HZ) potentiometer R-2, PC-603, for a minimum audible beat rate.

3-6 FM WHITE

A. Place scanner in normal operating position. Locate PC-603 board.

B. Set function switch to "WHITE", mode switch to 1 or 2, 2W-4W switch to 2W, PIC-TALK switch to TALK, speaker monitor VOL to maximum. Push "SEND" button.

C. Adjust the FM WHITE (1500 HZ) potentiometer R-3, PC-603, for a minimum audible beat rate.

3-7 AM CARRIER FREQUENCY

NOTE: AM carrier frequency interacts with the FM BLACK adjustment. Sec. 3-5 must be completed before the following procedure can be accomplished.

A. Place scanner in normal operating position with cover removed. Locate PC-603 board. Press "SEND" button.

B. Set function switch to "WHITE", mode switch to 3 or 4 with PIC-TALK switch to PIC.

C. Monitor the output (2-wire or 4-wire set up) and adjust the AM CAR FREQ potentiometer R-1, PC-603 to 1800 HZ.

3-8 OUTPUT LEVEL

A. Place scanner in normal operating position. Locate PC-603 board.

B. Set function switch to "WHITE", PIC-TALK switch to PIC, mode switch to 4. Press "SEND:" button.

C. Attach an output meter of suitable sensitivity to the 2W jack and adjust AM OUTPUT potentiometer R-4 to "0" db.

3-9 FM OUTPUT LEVEL

NOTE: This adjustment can be made with the machine in the normal operating position

A. Attach a db meter terminated into 600 ohms to the 2W jack. Place 2-W 4-W switch in 2-W position.

B. Place function switch to "BLACK". Press "SEND" button.

C. Adjust FM level potentiometer R-5 for "0" db.

3-10 SUBSTITUTE WHITE

A. Substitute white is equal to reference diode voltage: there is no adjustment.

3-11 START LIMIT CONTACTOR

A. Place scanner in normal operating position, with the cover removed.

NOTE: The contact point is adjusted by loosening the screw holding the gold contact strip (Fig 2) and then sliding the strip. In AUTOMATIC mode the start limit contact becomes electrically alive at 4 seconds into the picture regardless of drum speed.

B. With optical head at the left end of its traverse (starting position) and function switch set at "PULSES", locate the compliant wire contact on the top rear of the optical head.

C. Set function switch to PICTURE, push "SEND" button thus starting drum rotation and lead screw traverse.

D. Watch compliant wire contact; after 4 drum revolutions at 120 rpm (or 2 revolutions at 60 rpm) wire contact should be free of gold contactor strip.

3-11 START LIMIT CONTACTOR cont'd

E. Adjust this action as necessary by loosening holding screw of contactor and shifting the gold contactor strip to the left or right.

F. After adjustment, check switch timing by reversing the lead screw direction via the function switch "PULSES" and PICTURE positions. Continue to adjust and check until switch timing is precise.

3-12 FINISH LIMIT CONTACTOR

A. Place scanner in normal operating position, with cover removed.

NOTE: The finish limit contact is factory set for normal 8-inch copy. To re-establish this setting follow steps B through E below. To set the contactor at some other position, follow steps F and G below.

B. Stow optical head. (Sec 4.4 of manual)

C. Loosen the allen-head screw securing the finish limit contactor bracket to the track.

D. Slide the contactor bracket to the left, tight against the optical head support arm, and tighten bracket. Spring contact needs only to touch brass plate.

E. Unstow optical head. Scanner is now adjusted for standard 8-inch copy.

F. For non-standard copy, simply loosen the allen-head screw securing the finish limit contactor bracket, and slide the bracket along the track to a desired point where the optical head compliant spring wire contact will trip it.

G. When the new contact point is established, tighten the bracket.

3-13 DRUM MOTOR COUPLER

A. Place scanner in normal operating position, with cover removed. Locate the coupler adjustment screw, a 3/64" allen-head set screw which is actually hidden by the rubber drum motor coupler. Access to this screw is provided by a small hole in one face of the rubber coupling.

CAUTION: **Loosening the coupler set screw will also loosen the drum bearing point assembly. Care should be taken to keep the bearing point assembly all the way on the motor shaft while adjusting and tightening the coupler. Note that the drum need not be removed when adjusting coupler.**

B. Insert a 3/64" allen-wrench into the access hole in the rubber coupling, and "find" the set screw. Loosening the set screw will allow the coupler to be moved a small amount to the left or right. Adjust for "SNUG" fit.

SECTION 4 - SERVICE AND PARTS REMOVAL

4-1. COVER

A. Loosen two knurl-head thumb screws on sides of machine until shoulders clear the slots in the plastic cover.

B. Raise the cover directly up and off.

C. To replace cover reverse above procedure but first raise the leadscrew lever near the right end of the drum so that it will clear into the slot as the cover comes down.

4-2. STANDARD SERVICE POSITION

A. Set the scanner on its rear edge.

B. Remove the three screws holding the bottom cover in place. (Note that two of the screws also serve as retainers for rubber feet.)

C. Remove cover (Sec. 4-1)

D. Firmly grasping the protruding thumbscrews lift the scanner out of its bottom cover and set it on its front edge.

E. On the right side (left or right designations will refer to the technician's left or right, as he faces the scanner) locate the three allen-head screws that secure the rear chassis frame. (See Fig. 3) Note that these access screws are the three topmost screws on the chassis frame.

F. Remove the three access screws and swing the rear chassis frame (which is hinged on the left side) up, exposing the chassis for service.

> Caution: When swinging the rear chassis frame closed be very carefull to guide the top edge of PC board 602 into its support slot on the SEND-RESET switch assembly. Forcing the rear frame shut without aligning PC-602 will almost certainly damage the board.

4-3 STOWING DRUM

A. Rotate drum so that copy clamps are on top, insert allen wrench (provided in Spares-Service Kit) into the screw on the left side of chassis cover (marked DRUM STOWAGE.)

B. Rotate the wrench counter-clockwise to finger tight limit. The drum should be seen to move to the right side of the machine and become secure by this procedure.

C. Unstow the drum by simply rotating the stowage screw clockwise until the screw can be turned no further.

4-4 STOWING OPTICAL HEAD

A. Lift lead screw lever, bear the optical head against the right limit of its excursion and insert the allen wrench into the screw on the right side of the chassis cover (marked OPTICAL STOWAGE.)

B. Rotate the wrench clockwise to finger tight limit. The optical head should be seen to lift and be fastened securely to the right side of the machine by this procedure.

C. Unstow the optical head by simply rotating the stowage screw counterclockwise until head is released.

4-5 SPARES-SERVICE KIT

A. The kit is housed in a long flat metal box. The box is the upper half of the cover case, wedged into an opening cut in the cushioning liner to receive it. To remove grasp it firmly at either end and depress the bakelite plate in that area.

B. Ease one end of the box up and out until it clears the bakelite plate on the liner, then lift the box completely free.

C. To replace box push one end under the cushioning material (foam) and depress the bakelite plate at the other end of the case while pushing the box down into its compartment.

D. The kit contains the following items: a 1/8 allen wrench, 1 bag of assorted allen wrenches, 1 pair exciter lamps 2 cables - GO and RET, 4 fuses, 2 START/STOP lamps, 1 screwdriver, 1 AC plug. An extra allen wrench will be found in the chassis frame, right side (Fig. 3).

4-6 HANDSET

The handset is normally hidden by the Spares-Service Kit and is only accessible with the kit removed. The handset fits into a special opening cut in the cushioning liner of the upper cover case. The leads are neatly tucked into a slot in the cushioning liner on all four interior faces of the cover. The handset will be held securely in place when the Spares-Service Kit is replaced.

4-7 FUSES

Two fuses are located in their holders at the top left rear of the chassis, and are accessible when cover is removed. Four replacement fuses are provided in the Spares-Service Kit. Maintain this reserve supply as fuses are used.

4-8 PUSHBUTTON DISPLAY LAMPS

A. With scanner in normal operating position and cover removed (Sec. 4-1), firmly pull pushbutton straight up and out.

B. With pushbutton free, lamp may be removed and replaced. Extra lamps are in the Spares-Service Kit.

C. After lamp replacement reseat the pushbutton and push it firmly into its socket.

4-9 EXCITER LAMPS

(See Fig. 10 and 11)

A. Remove cover (Sec.4-1).

B. Remove drum (Sec. 4-10).

C. Remove exciter lamp leads from spring clips (push top of clips.)

D. Unscrew two white thumb nuts, remove old lamps and place thumb nuts on new lamp leads.

E. Install new lamps in reverse procedure.

NOTE: Check that both new exciter lamp light. If one lamp lights brilliantly, loosen the thumb nuts and gently pull the center leads to undo a possible short. Remount drum and cover.

4-10 DRUM

(See Fig. 2).

A. Before removing drum, check that both drum and optical head are unstowed (Sec. 4-3,4-4)

> Caution: The following procedure should be possible with only light efforts. Forcefulness could damage bearings.

B. Place scanner in normal operating position, cover removed.

C. Raise lead screw lever, move optical head to right, and rotate drum so that copy clamps are on top (Fig.2)

D. Push drum axially to right, and raise drum up and off motor coupling. Remove drum.

E. Install drum by reversing above procedure.

4-11 LEAD SCREW

(See Fig. 2,2A)

A. Place scanner in normal operating position, cover removed.

B. Loosen the pivot pin setscrew.

C. Remove the torsion clutch retainer screw.

D. While supporting the right-hand end of the lead screw, move the optical head to the right.

E. Gently lower the right end of the lead screw while drawing it toward you, until it clears the optical head. Then lift it off its bearings and out.

F. Install lead screw by reversing above procedure.

4-12 OPTICAL HEAD

(See Fig. 2,9,10,11,and 12)

A. Remove drum (Sec. 4-10)

B. Remove lead screw (Sec. 4-11)

4-12 OPTICAL HEAD (Cont'd.)

C. Remove the brake cord by pushing its right-side retainer out of its hole in the chassis.

> Caution: Push from inside the chassis just hard enough to let the pin clear the chassis. Do not over-stretch the extension spring.

D. Loosen the two screws securing the optical cable clamp to the inside face of the chassis rear panel. When the clamp pivots free, (to the left) unplug the optical cable.

E. Hold the carriage return spring, (negator) to keep it from suddenly coiling shut, and unscrew it from the optical head. Carefully let the free end coil about its drum.

> Note: Although the optical head still seems secure on its tracks, it may now be lifted clear of the tracks by manipulating it as described in steps F and G below.

> CAUTION: While freeing the head from its tracks, be careful not to crimp or otherwise damage the optical cable.

F. Squeeze the pivotable scanner support arm tightly (Fig.10, part B-1068) and gently but firmly lift the lower right end of the head off the track.

G. Keeping pressure on the support arm, move the left end of the head out from under the upper track and then lift the whole head up and free of the tracks.

H. To replace the optical head first compress the pivotable scanner support arm and guide it under the upper track.

I. Next, lift the right end of the head slightly, position the left bottom rollers on the track. Firmly push the right side in until the roller bearings lock onto the tracks.

> Caution: The above steps are possible with only moderate efforts. Do not attempt to force these mechanical actions.

J. Once the head is installed on its tracks, continue reassembly by reversing the procedures in steps E,D,C,B, and A, above.

4-13 PHOTO MULTIPLIER TUBE

(See Fig. 10 and 11)

A. Remove drum (Sec. 4-10)

B. Remove lead screw (Sec. 4-11)

C. Remove optical head (Sec. 4-12)

D. Unsolder the three photo multiplier leads (white, black, and red)

E. Remove the three screws holding the retainer plate to the optical head. (See head-on view of plate in Fig. 10)

F. Remove the round rubber plug from the tube housing.

G. The photo multiplier tube may now be grasped and removed from the socket.

H. When re-installing photo multiplier tube it must be positioned so that the tube face is oriented toward the "window" in the housing.

I. Continue installation by reversing the remaining removal procedures.

4-14 CHOPPER

(See Fig. 2,6,and 7)

A. Place scanner in normal operating position, cover removed.

B. Remove the single screw which secures the chopper assembly.

C. Remove brake cord (Sec. 4-12C).

D. Remove upper lead screw motor mount by removing two screws (one on each side of the motor mount).

E. Remove the start-limit contactor (Sec. 3-14).

F. Remove the start-limit contactor bracket by removing the single screw securing it to back of front chassis.

G. Remove the plastic cable clamp.

H. Remove the finish-limit contactor (Sec. 3-15)

4-14. CHOPPER (Cont'd.)

I. Remove screw securing top guide track to the left side of the chassis and slide the track partly out of the chassis, approximately 3 inches to the left.

J. After loosening the adjusting screw (Sec. 3-15C), slide the finish-limit contactor bracket off the guide track (to the right).

K. The chopper assembly with its leads may now be unplugged and removed.

L. To replace chopper and leads, position the chopper, dress leads in their approximate position, connect plug and reverse the above removal procedure.

> Caution: Take care while installing choper leads to insure that leads sit in their indented grooves or spaces, and check that leads do not interfere with the optical head bearings in any position.

4-15. DRUM MOTOR

(See Fig. 1, 2 and 6)

A. Place scanner in normal operating position, cover removed.

B. Remove drum (Sec. 4-10).

C. Remove chopper (leave its leads intact) and swing it out of the way (Sec. 4-14B).

D. Remove the four drum stowage collar support screws, 2 on front face and 2 on side face of chassis, Remove collar.

E. Remove upper lead screw motor mount by removing two screws (one on each side of the motor mount), thus freeing the drum motor cable.

F. Disconnect drum motor plug.

G. Remove the three motor mount screws securing the drum motor to the chassis, and remove motor.

H. Replace motor by reversing above procedure.

4-16 LEAD SCREW MOTOR

(See Fig. 1,2, and 6

A. Remove drum (Sec.4-10)

B. Remove lead screw (Sec. 4-11)

C. Remove the brake cord (Sec. 4-12C).

D. Hold the carriage return spring (negator) to keep it from suddenly coiling shut and unscrew it from the optical head. Carefully let the free end coil about its drum.

E. Remove upper lead screw motor mount by removing two screws (one on each side of the motor mount).

F. Disconnect the lead screw motor plug.

G. Remove lower lead screw motor mounting screw.

H. Remove the lead screw motor. Free the lead screw motor by pulling out and down.

I. When replacing the lead screw motor take care to set the case into the chassis so that the motor bushing fits into the hole.

J. When lead screw motor is positioned continue installation by reversing the removal procedures.

4-17 P.C. BOARD 602

(See Fig.2)

A. Place scanner in service position (Sec.4-2)

B. Locate the PC-602 board and simply unplug it.

4-18. P.C. BOARD 601 -200

(See Fig. 1 and 2)

A. Place scanner in normal operating position, cover removed.

B. Loosen two screws securing the optical cable clamp to the inside face of the chassis rear panel. When the clamp pivots free, (to the left) unplug the optical cable.

C. Place scanner in service position (Sec. 4-2), but before unfolding the rear frame, remove the cable clamp on the left chassis face and unplug the 12-prong connector.

D. Disconnect the lead screw motor plug, drum motor plug and chopper plug.

E. Push out the hinge pin from the chassis bottom (Fig. 2) and remove the entire rear frame.

F. The PC-601 -200 board combination can now be removed by unscrewing the six screws securing it to the chassis.

G. Replace the circuit boards by reversing the removal procedure.

4-19. PC. BOARD 100

(See Fig. 10 and 12)

A. Place scanner in normal operating position, cover removed.

B. Remove drum (Sec. 4-10)

C. Remove lead screw (Sec. 4-11)

D. Remove optical head (Sec. 4-12)

E. Unsolder the three photo-mulitplier leads (White, black, red).

F. Unsolder the two exciter lamp leads.

4-19 P.C. BOARD 100 (Cont'd)

G. Remove the four 4-40 screws securing PC-100 to the optical head. Remove PC-100.

H. Replace PC-100 by reversing the removal procedure.

4-20 MONITOR BOARD (PC-401)

(See Fig.5)

A. Place scanner in service position (Sec. 4-2)

B. Disconnect J1 (green), J2 (red), and J3(yellow) from PC-401.

C. Remove the three mounting screws securing PC-401 to the right face of the rear chassis frame. Remove PC-401.

D. Replace PC-401 by reversing above procedure.

4-21 AUTOCALL DECODER (PC-403)

(See Fig.5)

A. Place scanner in service position (Sec. 4-2)

B. Disconnect J1 (green), J2(red), and J3 (yellow).

C. Remove the four mounting screws securing PC-403 to the rear of the rear chassis frame. Remove PC-403.

D. Replace PC-403 by reversing above procedure.

4-22 POWER SUPPLY (PC-300)

(See Fig.1,2)

A. Place scanner in service position (Sec. 4-2), but before unfolding rear frame, remove the cable clamp on the left chassis face and unplug the 12 prong connector.

B. Unsolder the four wires to diodes C-300, 301, 302, 303, and also unsolder the transformer T-300 ground lead.

C. Remove the two allen-head screws on the top flange, and the two nuts and screws on the bottom flange of the rear chassis frame.

4-22 POWER SUPPLY (PC-300) (Cont'd.)

D. Disconnect plugs P-302 and 300.

E. With the top part of PC-300 moved away from the chassis for clearance, carefully unsolder the white-red, white-black, and red leads from the hybrid assembly. Be cautious to avoid burning any insulation.

F. The power supply board may now be removed.

G. Install PC-300 by reversing the above procedure.

4-23 TRANSFORMER T-300

(See Fig. 2 and 5)

A. Place scanner in service position (Sec. 4-2) but before unfolding the rear frame, remove the cable clamp on the left chassis face and unplug the 12-prong connector.

B. Push out hinge pin from chassis bottom (Fig. 2) and remove the rear frame.

C. Unsolder the four wire leads to diodes D-300, 301, 302, 303, and also unsolder the transformer T-300 ground lead.

D. Remove the single screw holding the POWER switch on the frame.

E. Remove the five perimeter screws holding the end plate (contains the unit identification number) to the rear frame.

F. Swing the T-300 assembly out from the frame until there is enough clearance to unsolder the two line receptical connections.

G. The T-300 assembly may now be removed from the rear chassis frame, and may be further disassembled by removing the four nuts and screws securing the transformer to the end plate.

H. Replace the transformer by reversing the above procedure.

4-24 SEND/RESET SWITCH ASSEMBLY

(See Fig. 2,5)

A. Place scanner in service position. (Sec. 4-2).

B. Remove the four mounting screws securing the switch assembly to the chassis.

C. Disconnect the P-302 plug connector.

D. The SEND/RESET switch assembly may now be removed.

E. Replace switch assembly by reversing above procedure.

SECTION 5 - TROUBLE - SHOOTING

5-1. SERVICE NOTES

A. The standard service position is described in Sec. 4-2.

B. To check voltages, use a voltmeter with a sensitivity of at least 20,000 ohms per volt, or a VTVM. All voltages are read with the transmitter ON (Green SEND button lit).

C. While the chassis is open, it is good practice to check for obvious defects such as broken wires, loose solder joints and foreign matter which could cause a short.

> Caution: When soldering on printed circuit boards a low voltage iron is recommended, with no more than 50 watts power. All double-sided boards have plated-through holes. Hence, should a component be removed from a hole that carries a circuit, its replacement should be soldered on both sides to insure against the possibility that the component removal also removed the plating in the hole.
>
> Caution: Do not force mechanical parts. Do not use heavy grease or oil to lubricate the drum motor bearings.

D. The Trouble-shooting Chart which follows lists some of the more common problems which may arise during operation of the 16-S-D/F. No table can list all possible causes for difficulties, but a technician with this chart, and a familiarity with the principles of operation, should be able to handle most problems.

5-2. TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
POWER-ON, but red RESET button does not light.	1. Blown fuses. 2. Unit mismatched to mains 3. RESET lamp burned out.	1. Check or replace fuses. 2. Check position of 110V-230V switch. 3. Replace lamp.
SEND button depressed, but green light does not stay lit, and machine does not start.	Start is attempted with MODE Switch at PICTURE.	Move MODE SWITCH TO ANY OTHER POSITION.
SEND button depressed, green light comes on, but exciter lamps and other functions do not operate.	5-V power supply is non-operative.	Q-308. Check for +5 volts at emitter of Q-308.
Drum makes one revolution, and scanner resets.	D-307 on PC-300 noisy.	Replace D-307
After automatic sequence scanner transmits picture approximately 4 seconds and then resets.	1. Lead screw did not reverse. 2. Start limit contactor has shifted.	1. See Sec. 2-13. 2. Adjust start limit contactor. (Sec. 3-14)
Autocall will not key scanner ON.	FUNCTION switch in MANUAL position.	Set FUNCTION switch to AUTOMATIC.

5-2. TROUBLESHOOTING CHART (Cont'd.)

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
After normal pulses scanner transmits black picture.	1. Exciter lamps burned out. 2. H.V. Dynode supply is inoperative.	1. Replace lamps. (Sec. 4-9.) 2. See Sec. 2-3.
Scanner resets each time optical head reaches some intermediate point in its travel.	Finish limit contactor has been moved to the left of its usual position.	Reposition finish limit contactor bracket (Sec. 3-15.)
After normal pulses scanner transmits gray, washed-out picture.	ABC system did not set up. Scanner Transmitted PULSES for more than 30 minutes.	Press RESET and start again.

5-2. TROUBLESHOOTING CHART (Cont'd.)

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
Jitter.	1. Drum motor coupler needs adjustment. 2. Dirt on drum bearings.	1. Adjust coupler (Sec. 3-16.) 2. Remove drum. (Sec. 4-10.) Clean bearings.
Drums starts sluggishly	Drum motor coupling needs adjustment	Adjust drum motor coupler (Sec. 3-16.)
Drum does not start	1. Position of FUNCTION switch 2. Drum not fully unstowed.	1. Set FUNCTION switch to proper position (drum will not run unless switch is at PULSES, PICTURE or AUTOMATIC). 2. Unstow drum completely.

5-2. TROUBLESHOOTING CHART (Cont'd.)

TROUBLE (light-diode indications)	PROBABLE CAUSE	POSSIBLE REMEDY
LD300 (300.) not lit with power on.	1. Blown fuse 2. Unit mismatched to mains 3. Bad LD300 4. Bad 12V supply	1. Replace fuses 2. Check position of 115-230 switch 3. Replace LD300 4. Replace Q312, D309, or 300
LD301 (300) not lit after SEND button is depressed	1. 12.5 VDC bad	1. Check or replace Q309, LD301, or the 300
LD302 (300 .) not lit after SEND button is depressed	1. Lead-screw motor-drive bad (lead screw motor will not turn. 2. LD302 bad (lead-screw turns)	1. Check or replace Q311 or the 300 unit. 2. Replace LD302
LD303 (300 .) not lit after SEND button depressed	1. Bad LD303 2. +5 VDC bad	1. Check or replace LD303 2. Check or replace Q308. If OK replace 300
LD304 (300) not lit after SEND button is depressed	1. Drum-motor supply bad. (drum will not turn) 2. LD304 bad (drum will turn)	1. Check or replace Q310, or the 300 2. Replace LD304

5.2 TROUBLESHOOTING CHART (Cont'd.)

TROUBLE (Lite indications)	PROBABLE CAUSE	POSSIBLE REMEDY
Refer to Fig. 13, 2 B for Lite-Diode Locations		
LD12, (601) not lighting at drum rotation speed (601)	1. Bad chopper 2. Bad IC2	1. Replace chopper 2. Replace IC2
LD13 not constantly lit ½ of a second after start.	1. Drum not rotating 2. Bad IC2.	1. Check LD 304 300 board. If OK, check for mechanical binding and replace 200 board if necessary. 2. Replace IC2.
LD14 (601) does not light when K1 (601) is energized in accordance with program.	1. Relay K1 bad 2. Bad program	1. Replace K1. 2. Replace IC's 4, 5, 6, 7, 8. Replace board PC-601
LD15 (601) does not light when K2 (601) is energized in accordance with program.	1. Relay K2 bad 2. Bad program	1. Replace K2 2. Replace IC's 4, 5, 6, 7, 8. Replace board PC-601

5-3. MOTOR SUPPLY VOLTAGES

A. Drum motor supply	17 volts at 120 RPM 12.5 volts at 60 RPM
B. Lead screw motor supply	10 volts at 120 RPM 9.5 volts at 60 RPM

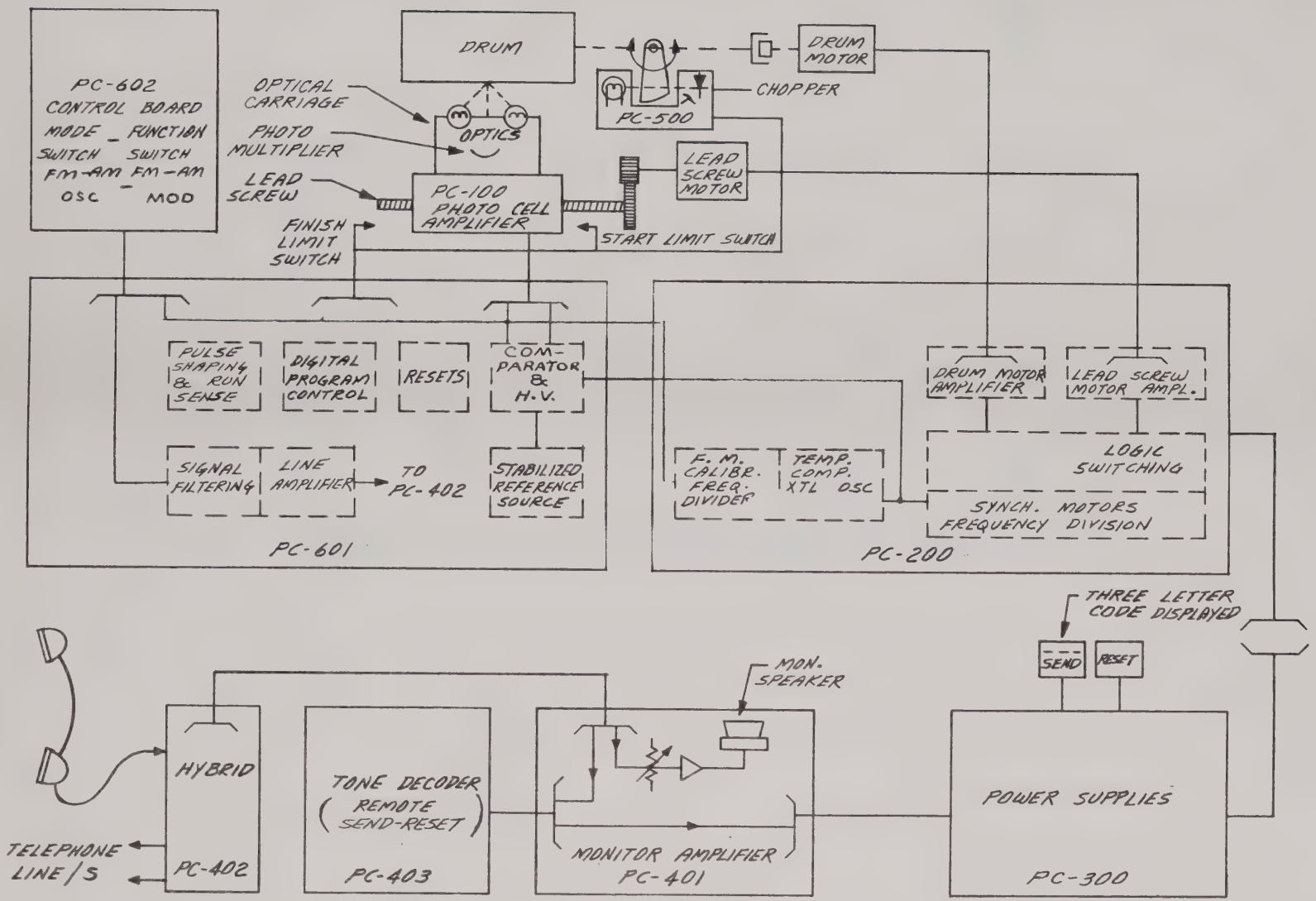


FIG. A

16-S-D/F
SYSTEM BLOCK
DIAGRAM

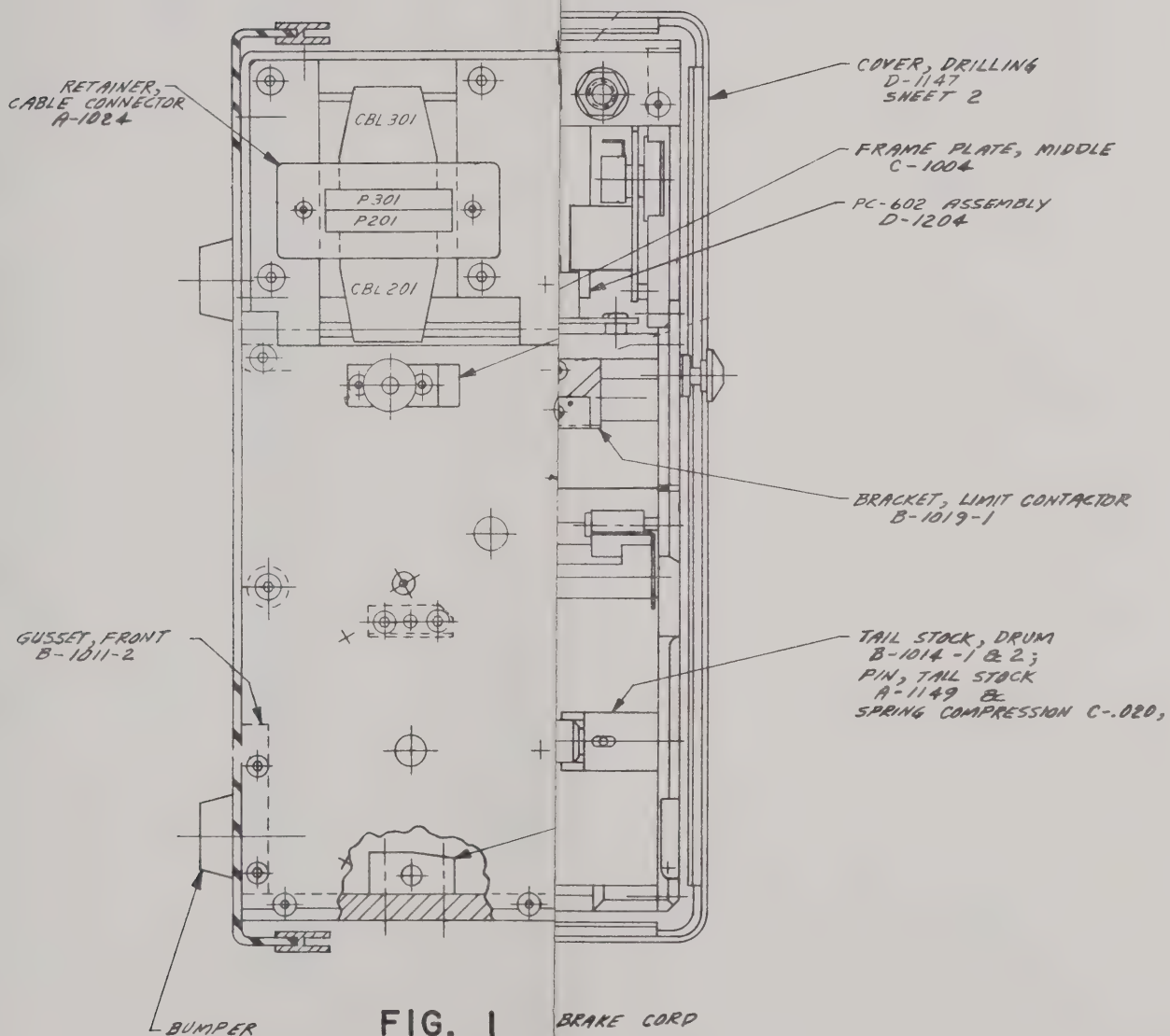

RETAINER, CABLE CONNECTOR A-1024
CBL 301
P 301
P 201
CBL 201
COVER, DRILLING D-1147 SHEET 2
FRAME PLATE, MIDDLE C-1004
PC-602 ASSEMBLY D-1204
BRACKET, LIMIT CONTACTOR B-1019-1
GUSSET, FRONT B-1011-2
TAIL STOCK, DRUM B-1014-1 & 2;
PIN, TAIL STOCK A-1149 &
SPRING COMPRESSION C-.020,
BUMPER

FIG. 1

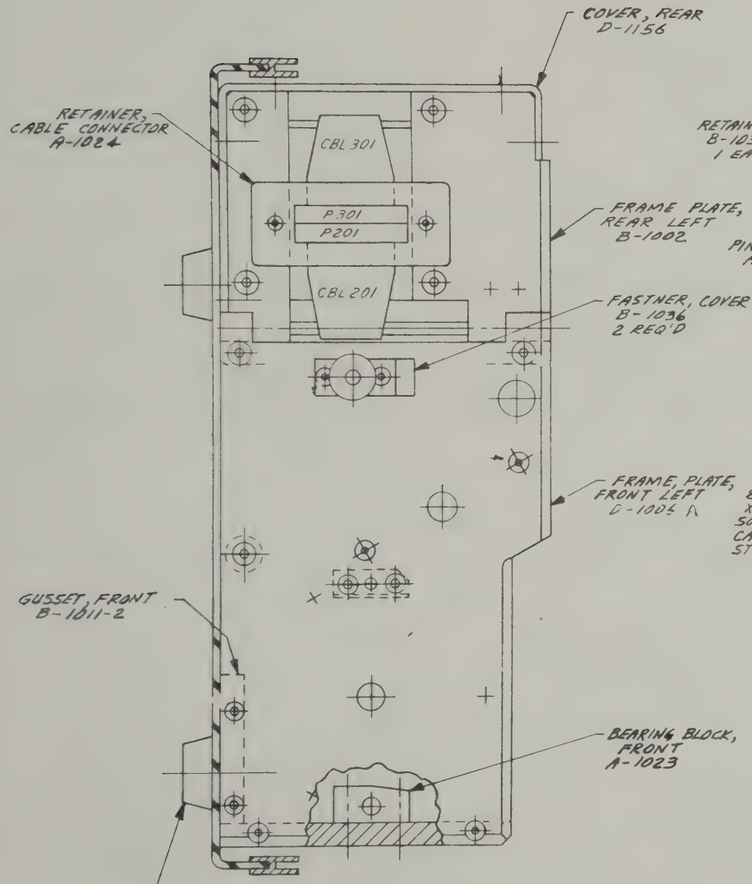

COVER, REAR
D-1156
RETAINER, CABLE CONNECTOR
A-1024
CBL 301
P301
P201
CBL 201
FRAME PLATE, REAR LEFT
B-1002
FASTNER, COVER
B-1036
2 REQ'D
FRAME PLATE, FRONT LEFT
C-1004 A
GUSSET, FRONT
B-1011-2
BEARING BLOCK, FRONT
A-1023
BUMPER

FIG. 1

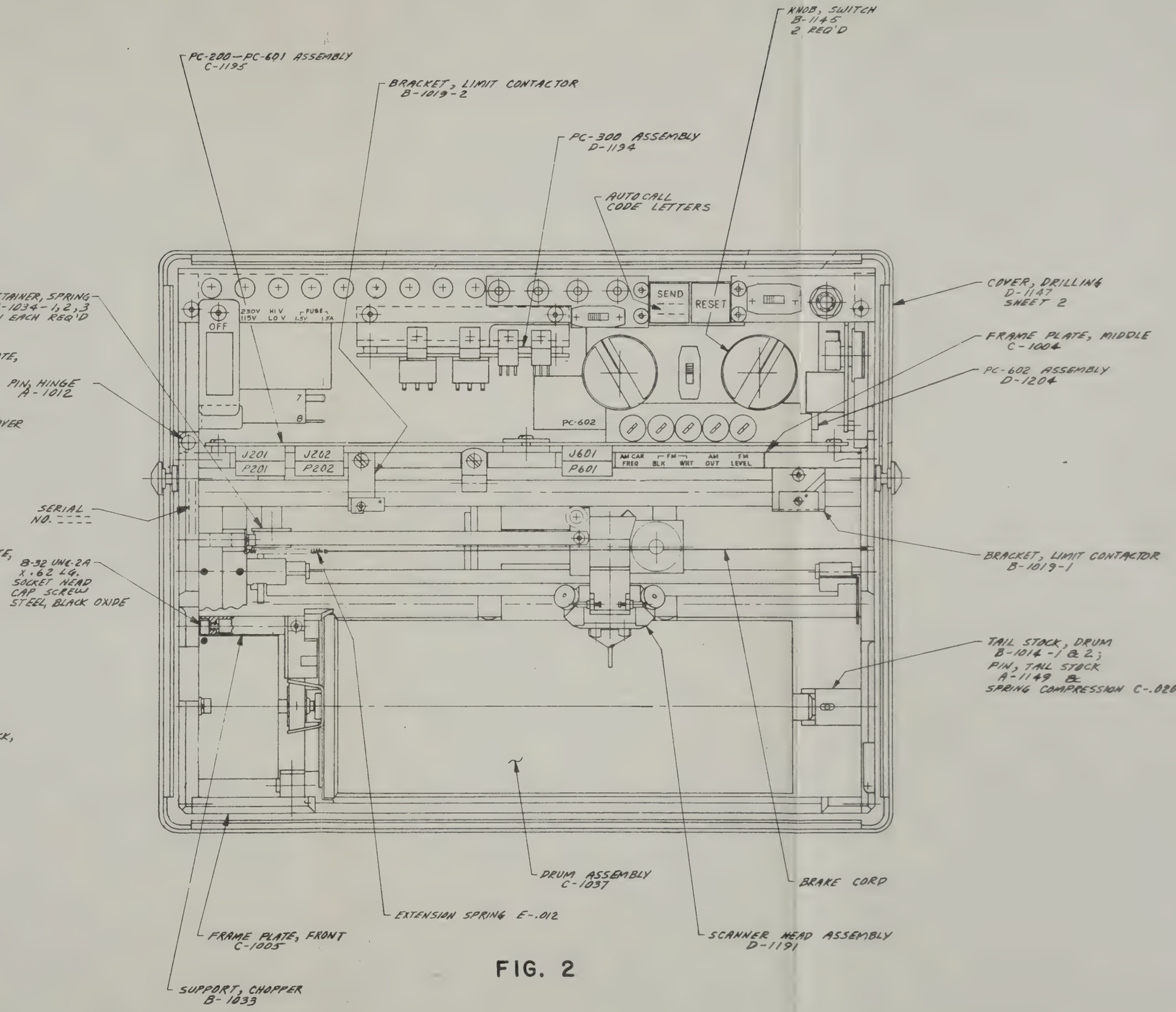

PC-200—PC-601 ASSEMBLY
C-1195
BRACKET, LIMIT CONTACTOR
B-1019-2
PC-300 ASSEMBLY
D-1194
AUTOCALL CODE LETTERS
KNOB, SWITCH
B-1145
2 REQ'D
RETAINER, SPRING
B-1034-1,2,3
1 EACH REQ'D
PIN, HINGE
A-1012
SERIAL NO. -----
B-32 UNC-2A
X .62 LG.
SOCKET HEAD
CAP SCREW
STEEL, BLACK OXIDE
SEND
RESET
OFF
230V 115V
HI V LO V
FUSE 1.5V 1.7A
7
8
PC-602
J201
P201
J202
P202
J601
P601
AM CAR FREQ
FM BLK
FM WHT
AM OUT
FM LEVEL
COVER, DRILLING
D-1147
SHEET 2
FRAME PLATE, MIDDLE
C-1004
PC-602 ASSEMBLY
D-1204
BRACKET, LIMIT CONTACTOR
B-1019-1
TAIL STOCK, DRUM
B-1014-1 & 2;
PIN, TAIL STOCK
A-1149 &
SPRING COMPRESSION C-.020,
DRUM ASSEMBLY
C-1037
BRAKE CORD
EXTENSION SPRING E-.012
FRAME PLATE, FRONT
C-1005
SCANNER HEAD ASSEMBLY
D-1191
SUPPORT, CHOPPER
B-1033

FIG. 2

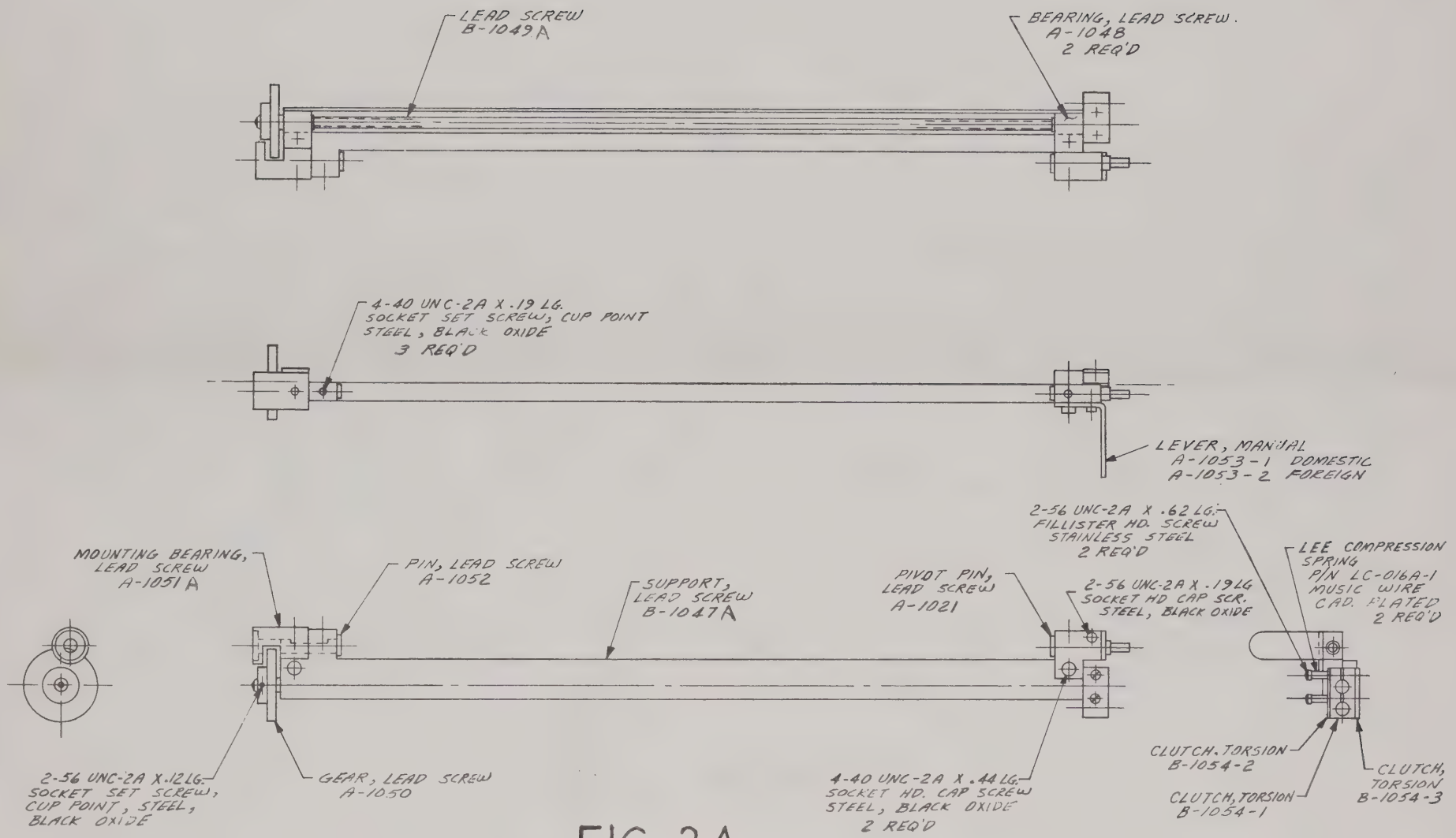

LEAD SCREW
B-1049A
BEARING, LEAD SCREW.
A-1048
2 REQ'D
4-40 UNC-2A X .19 LG.
SOCKET SET SCREW, CUP POINT
STEEL, BLACK OXIDE
3 REQ'D
LEVER, MANUAL
A-1053-1 DOMESTIC
A-1053-2 FOREIGN
2-56 UNC-2A X .62 LG.
FILLISTER HD. SCREW
STAINLESS STEEL
2 REQ'D
LEE COMPRESSION
SPRING
P/N LC-016A-1
MUSIC WIRE
CAD. PLATED
2 REQ'D
MOUNTING BEARING,
LEAD SCREW
A-1051A
PIN, LEAD SCREW
A-1052
SUPPORT,
LEAD SCREW
B-1047A
PIVOT PIN,
LEAD SCREW
A-1021
2-56 UNC-2A X .19LG
SOCKET HD CAP SCR.
STEEL, BLACK OXIDE
2-56 UNC-2A X .12 LG.
SOCKET SET SCREW,
CUP POINT, STEEL,
BLACK OXIDE
GEAR, LEAD SCREW
A-1050
4-40 UNC-2A X .44 LG.
SOCKET HD. CAP SCREW
STEEL, BLACK OXIDE
2 REQ'D
CLUTCH, TORSION
B-1054-2
CLUTCH, TORSION
B-1054-1
CLUTCH,
TORSION
B-1054-3

FIG. 2A

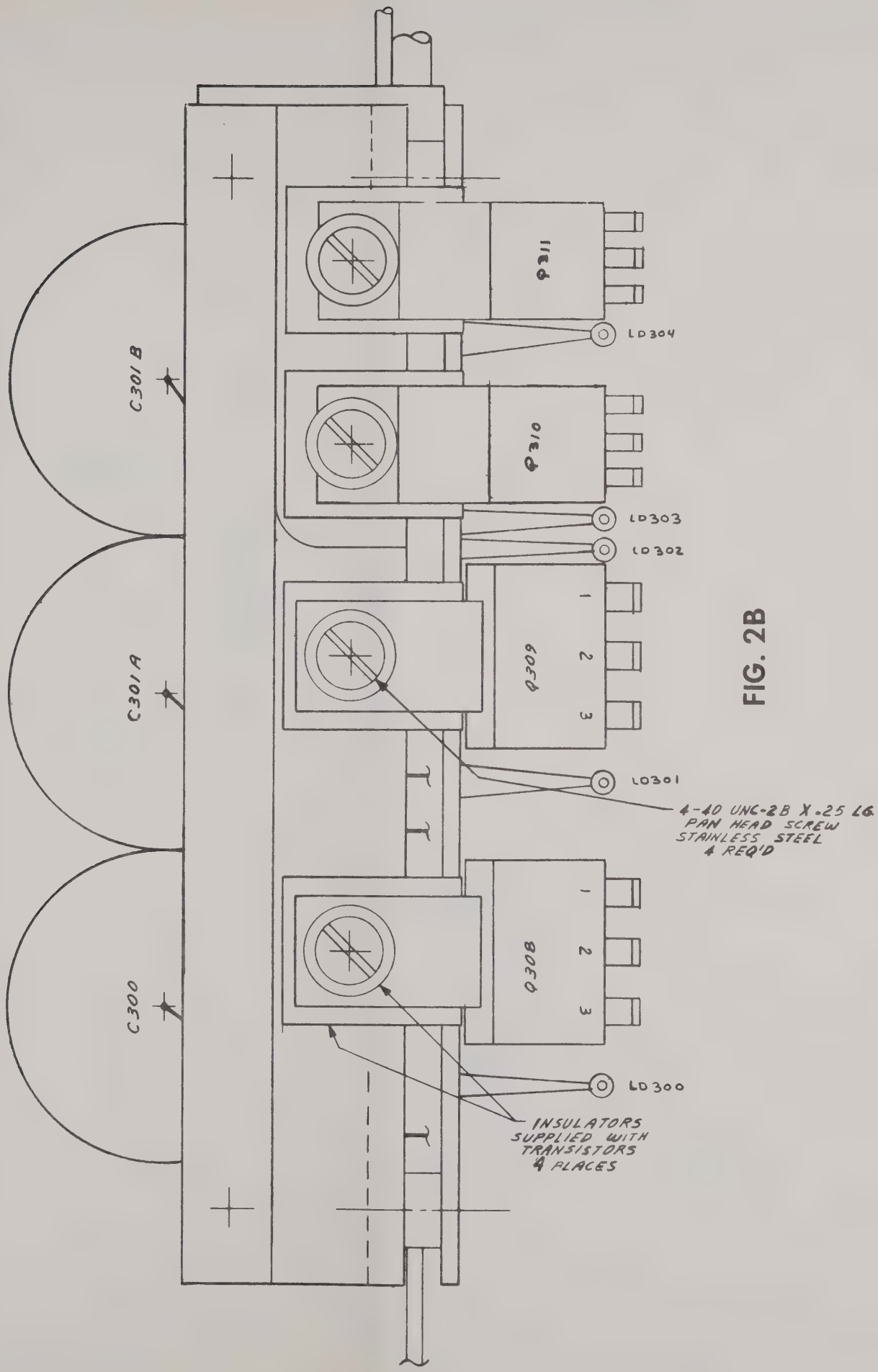
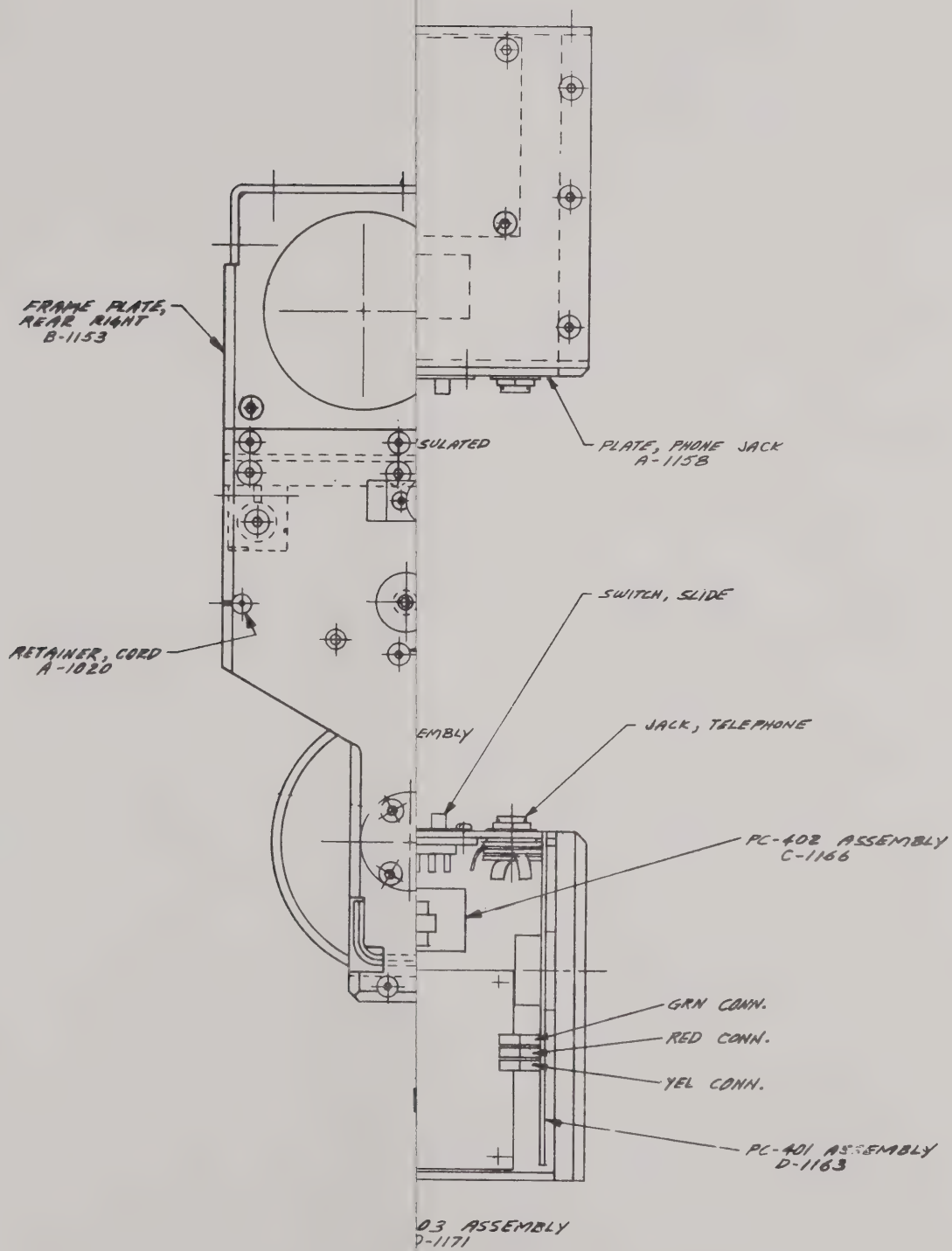

C301B
C301A
C300
Q311
Q310
Q309
Q308
1
2
3
LD304
LD303
LD302
LD301
LD300
4-40 UNC-2B X .25 LG.
PAN HEAD SCREW
STAINLESS STEEL
4 REQ'D
INSULATORS
SUPPLIED WITH
TRANSISTORS
4 PLACES

FIG. 2B


FRAME PLATE, REAR RIGHT B-1153
SULATED
PLATE, PHONE JACK A-1158
SWITCH, SLIDE
RETAINER, CORD A-1020
EMBLY
JACK, TELEPHONE
PC-402 ASSEMBLY C-1166
GRN CONN.
RED CONN.
YEL CONN.
PC-401 ASSEMBLY D-1163
03 ASSEMBLY
-1171

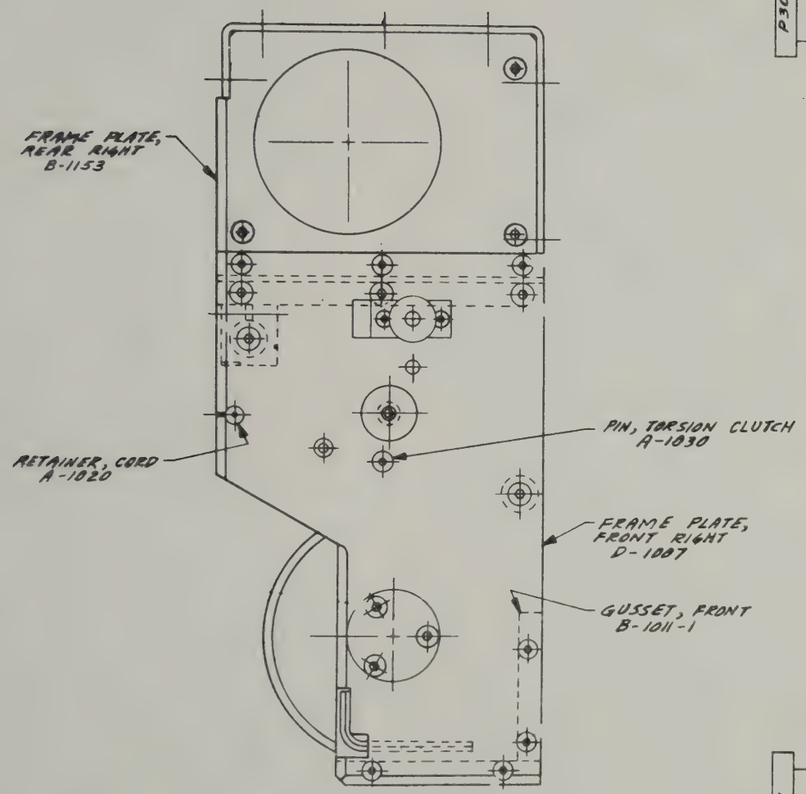


FIG. 3

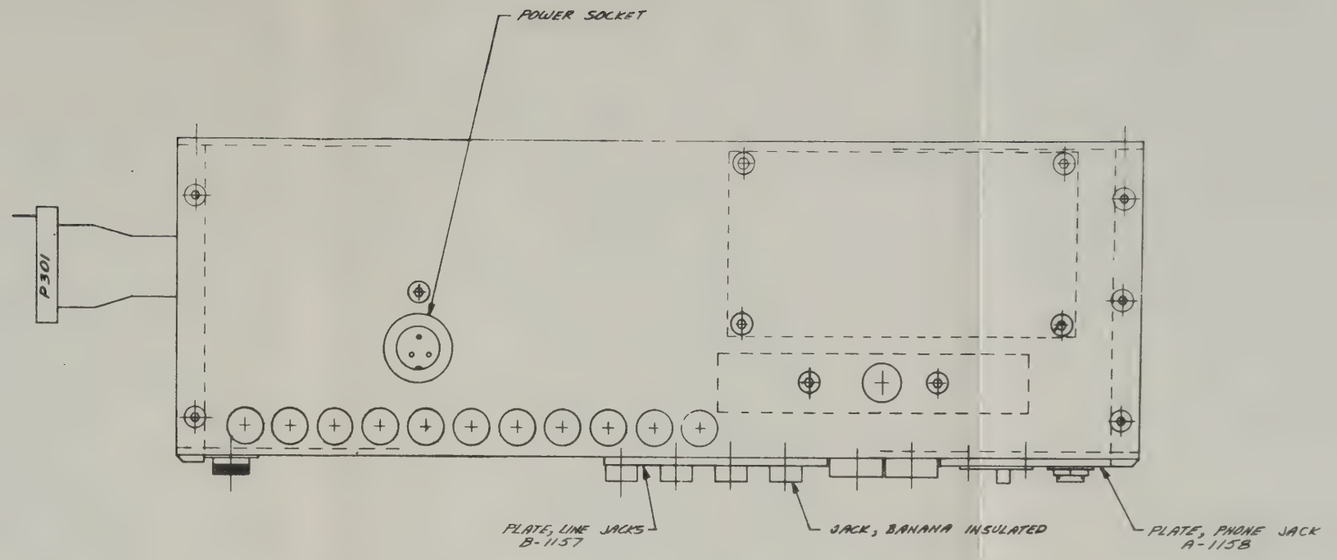


FIG. 4

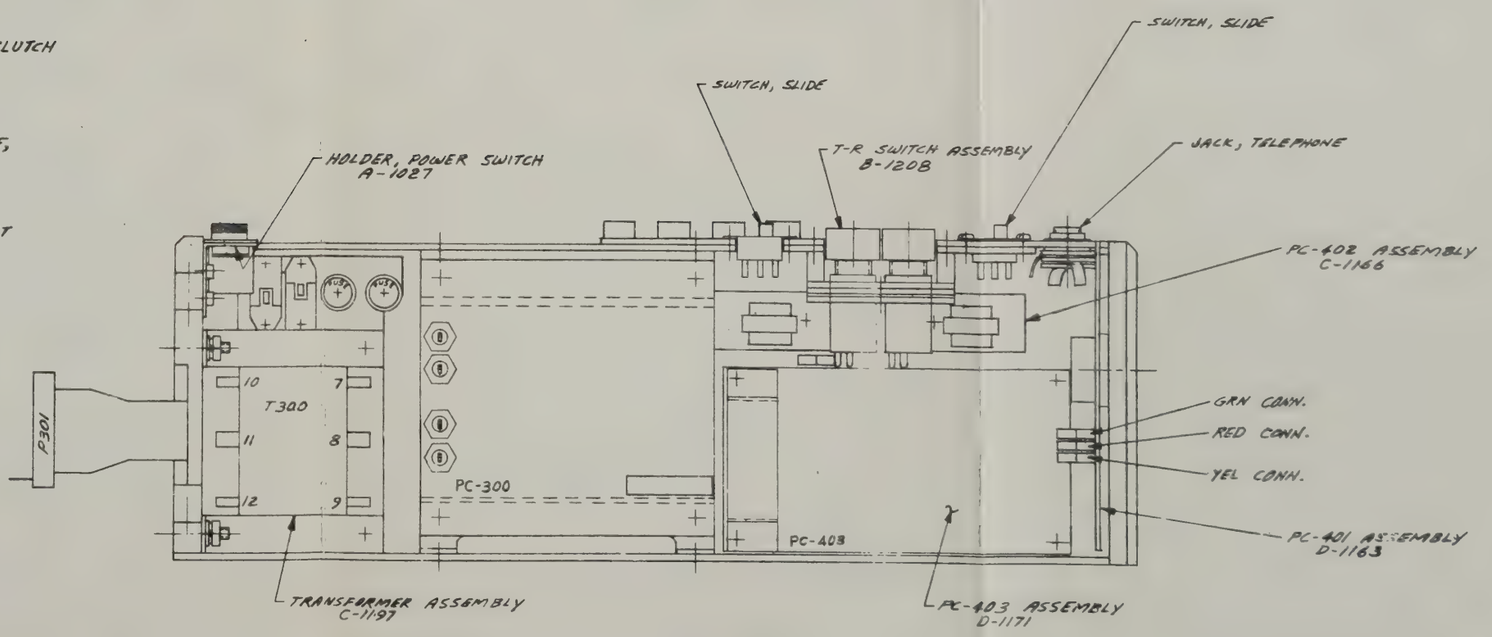


FIG. 5

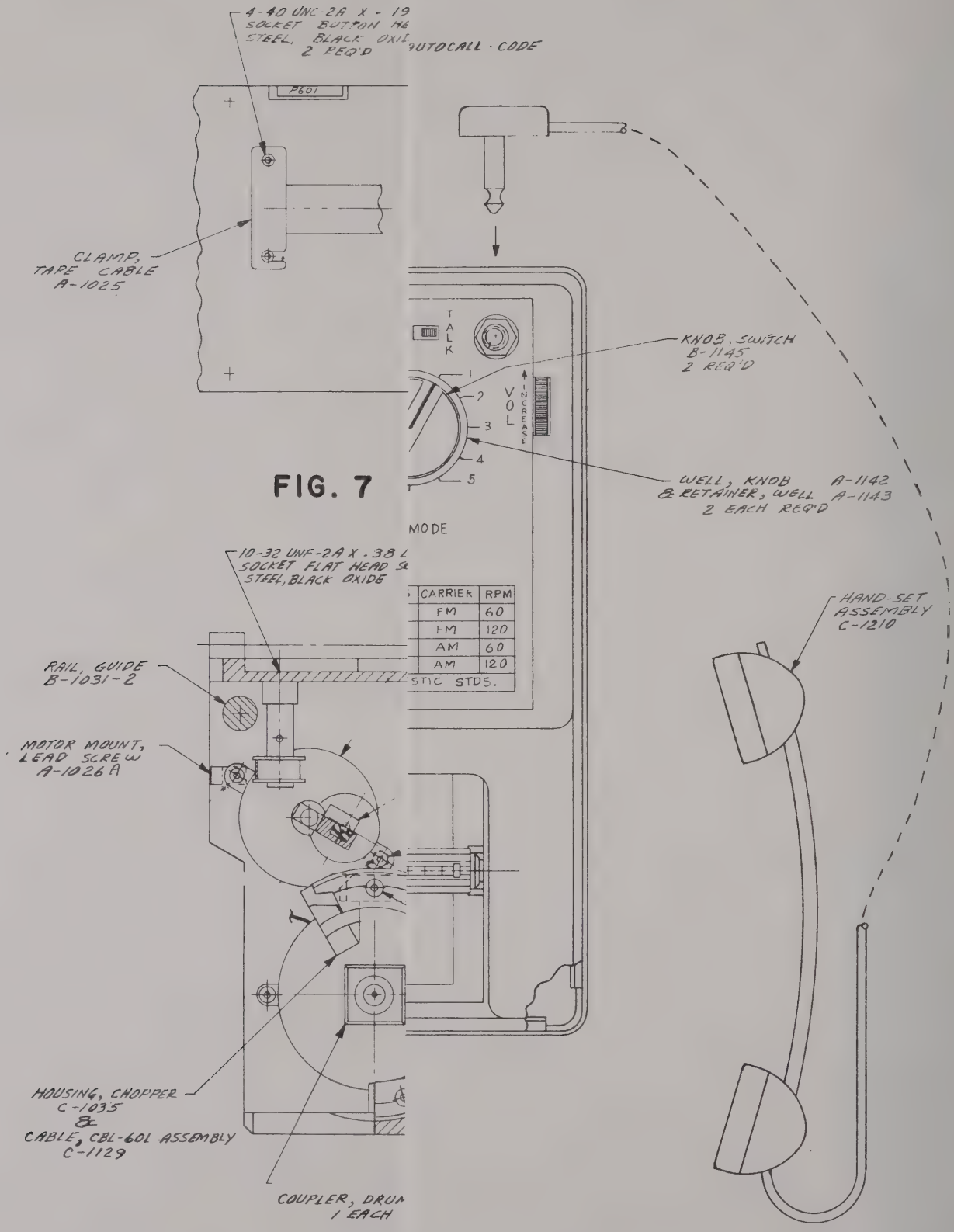

4-40 UNC-2A X - 19
SOCKET BUTTON HE
STEEL, BLACK OXIDE
2 REQ'D
AUTOCALL · CODE
P601
CLAMP,
TAPE CABLE
A-1025
TALK
VOL
INCREASE
1
2
3
4
5
KNOB, SWITCH
B-1145
2 REQ'D
WELL, KNOB A-1142
& RETAINER, WELL A-1143
2 EACH REQ'D
MODE
CARRIER
RPM
FM
60
FM
120
AM
60
AM
120
STIC STDS.
10-32 UNF-2A X .38 L
SOCKET FLAT HEAD S
STEEL, BLACK OXIDE
HAND-SET
ASSEMBLY
C-1210
RAIL, GUIDE
B-1031-2
MOTOR MOUNT,
LEAD SCREW
A-1026A
HOUSING, CHOPPER
C-1035
&
CABLE, CBL-601 ASSEMBLY
C-1129
COUPLER, DRUM
1 EACH

FIG. 7

FIG. (

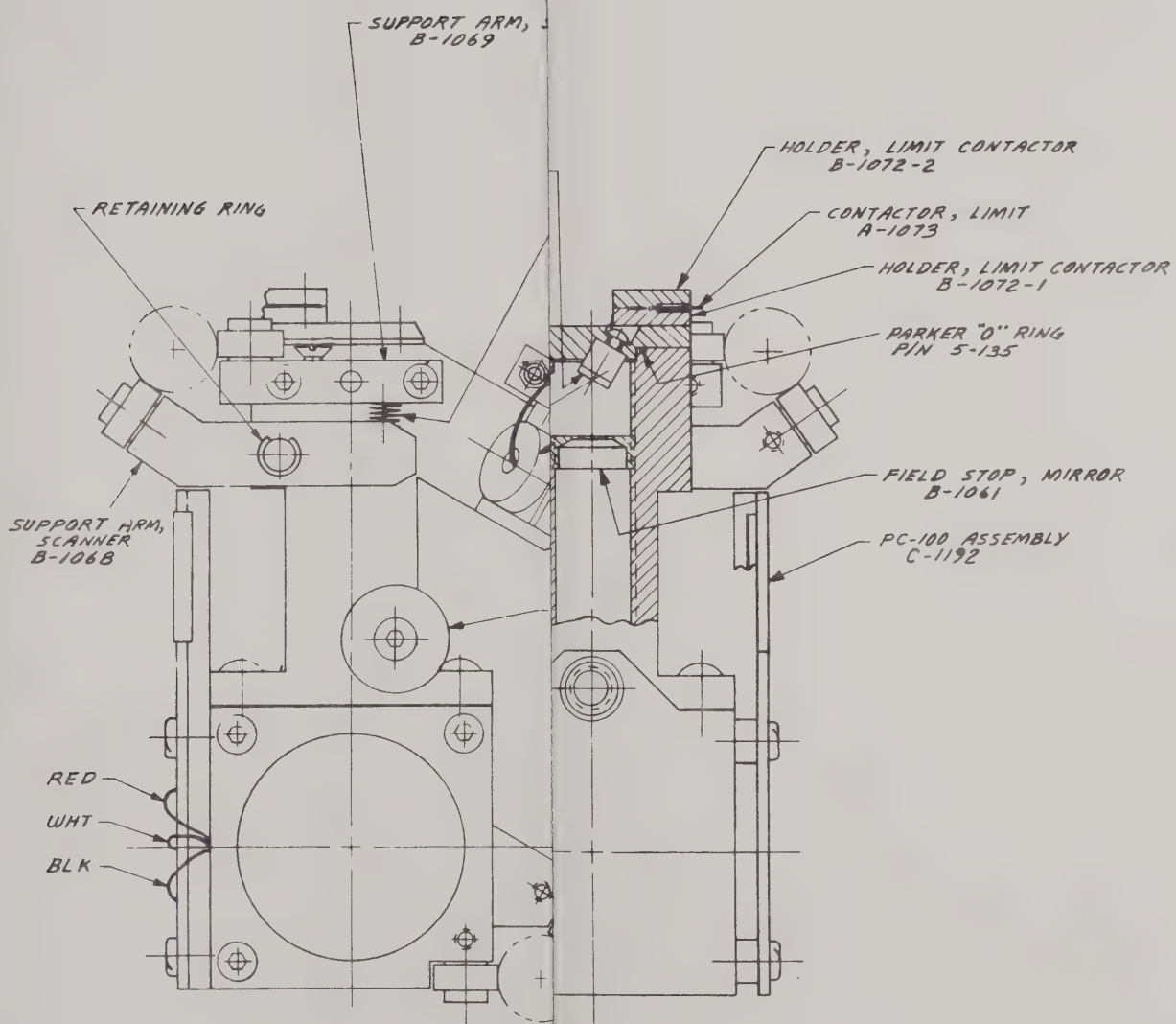

SUPPORT ARM,
B-1069
HOLDER, LIMIT CONTACTOR
B-1072-2
RETAINING RING
CONTACTOR, LIMIT
A-1073
HOLDER, LIMIT CONTACTOR
B-1072-1
PARKER "O" RING
P/N S-135
FIELD STOP, MIRROR
B-1061
SUPPORT ARM,
SCANNER
B-1068
PC-100 ASSEMBLY
C-1192
RED
WHT
BLK

FIG. 12

FIG. 10

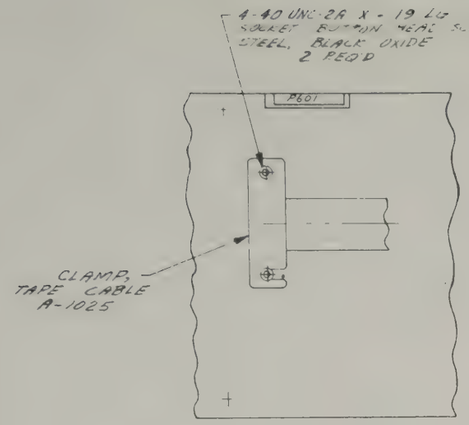


FIG. 7

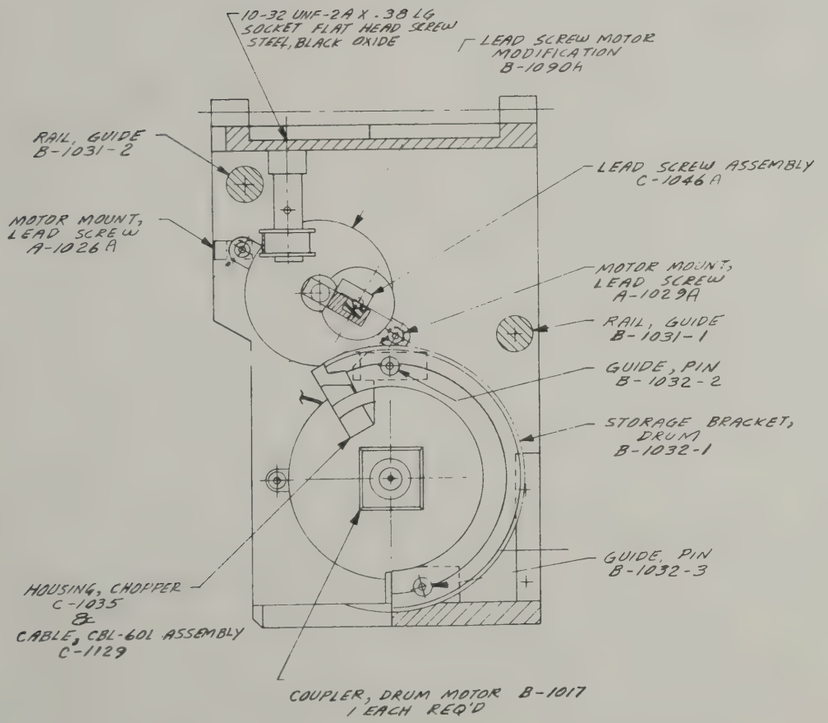
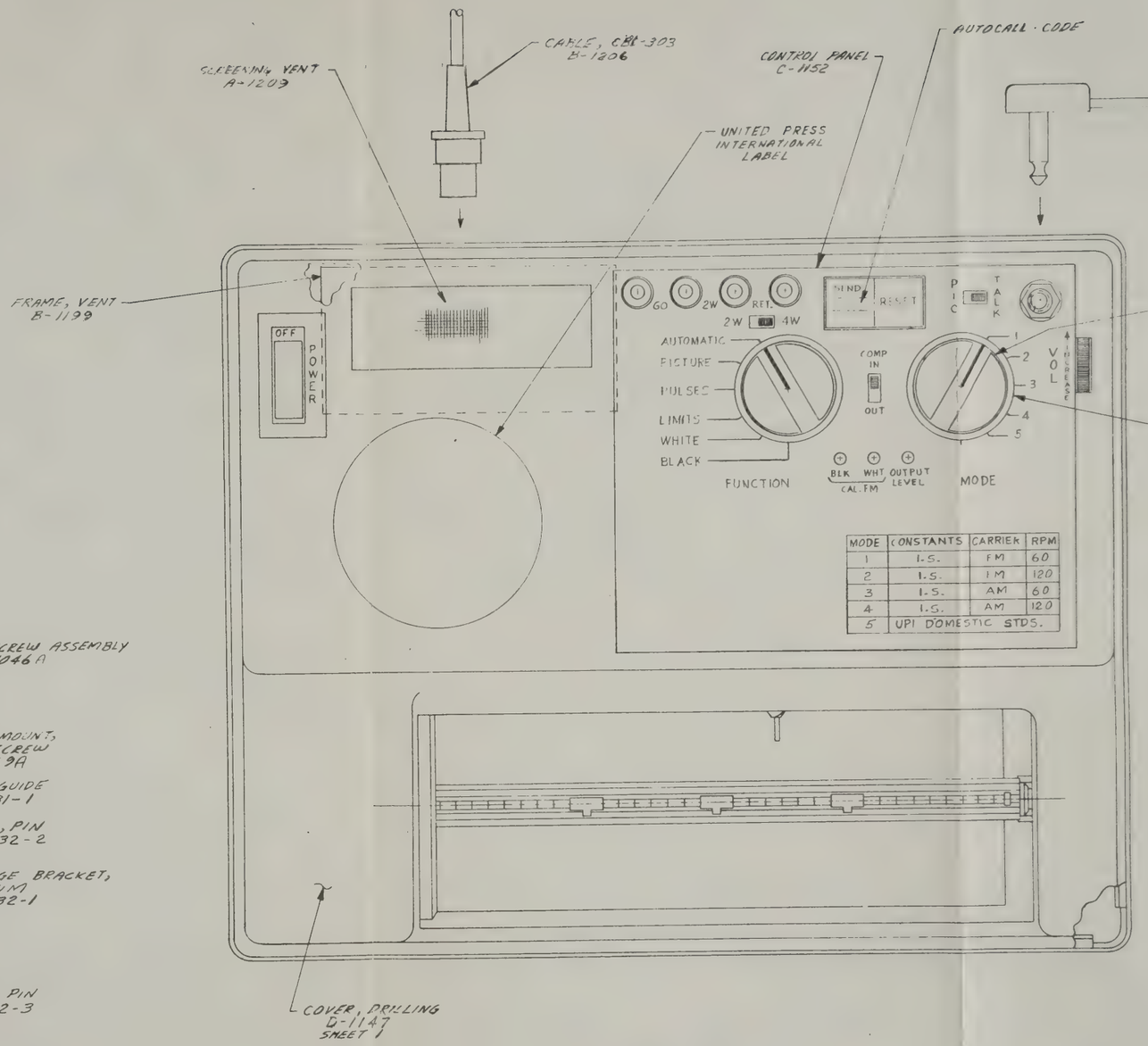


FIG. 6



MODE	CONSTANTS	CARRIER	RPM
1	I.S.	FM	60
2	I.S.	FM	120
3	I.S.	AM	60
4	I.S.	AM	120
5	UPI DOMESTIC STDS.		

FIG. 8

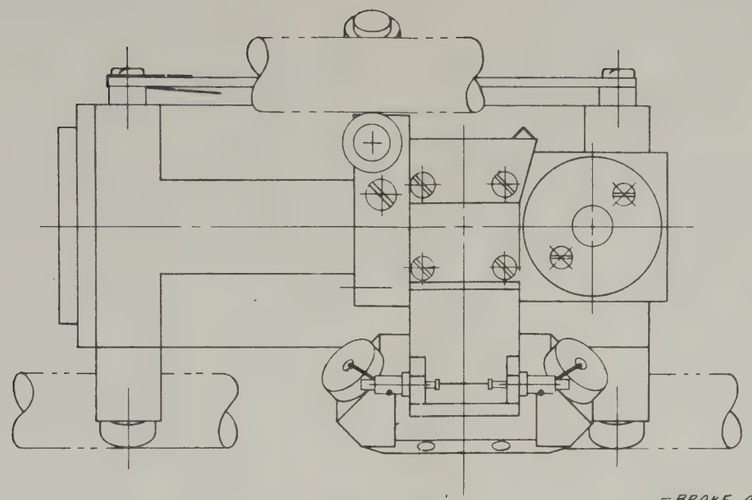


FIG. 9

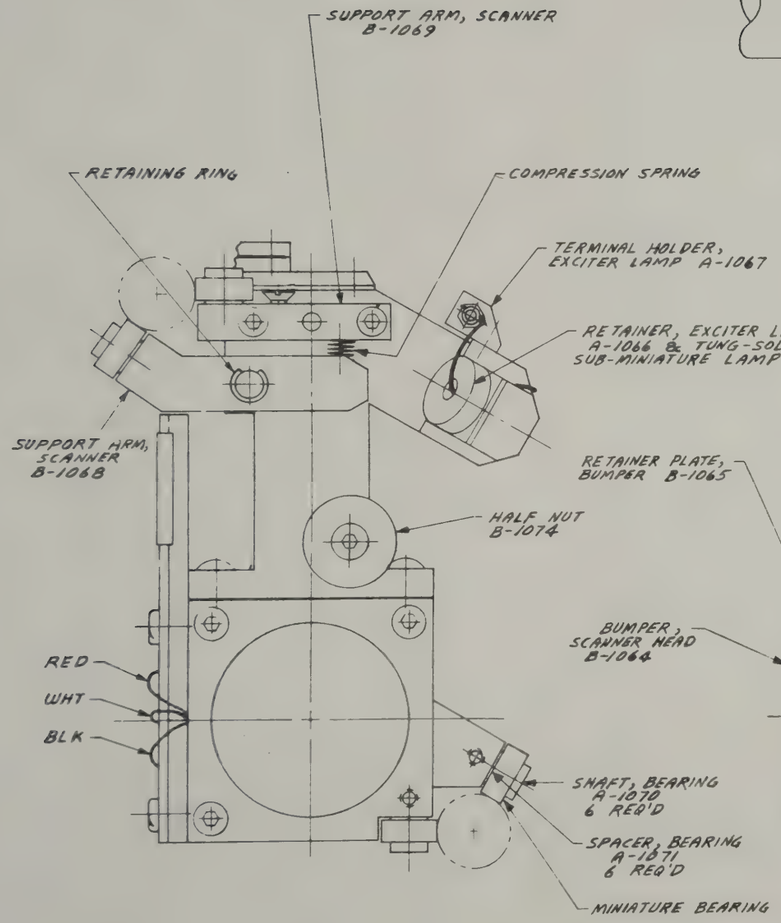


FIG. 10

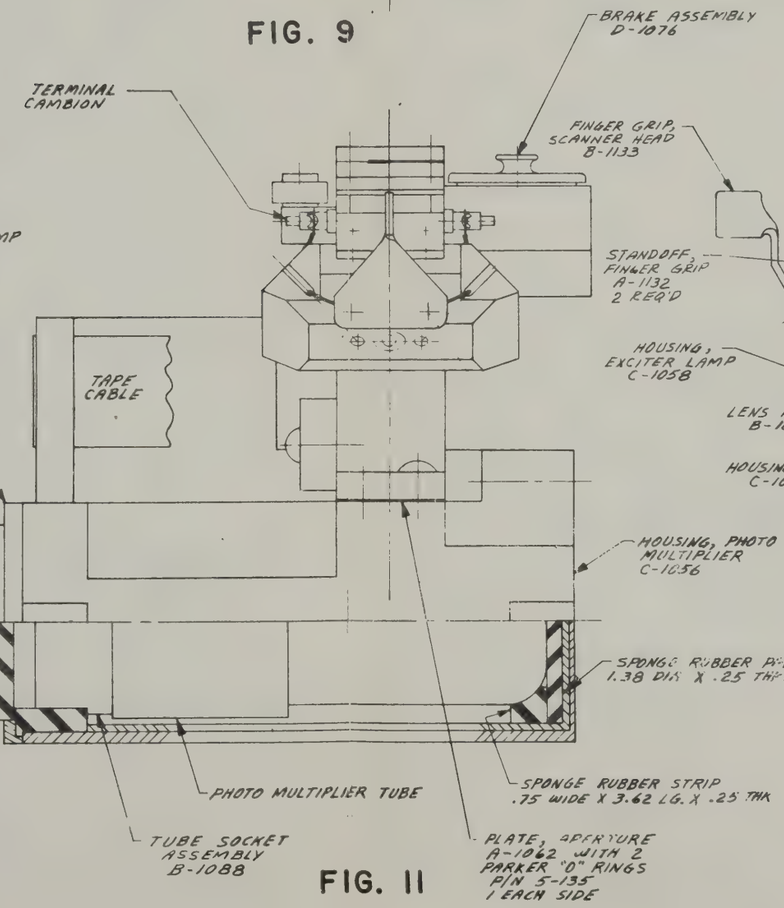


FIG. 11

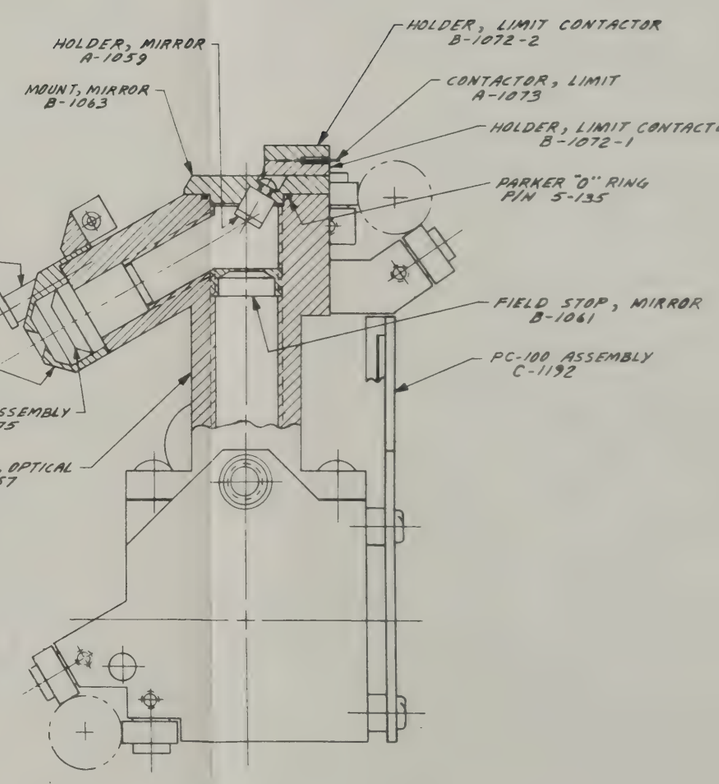
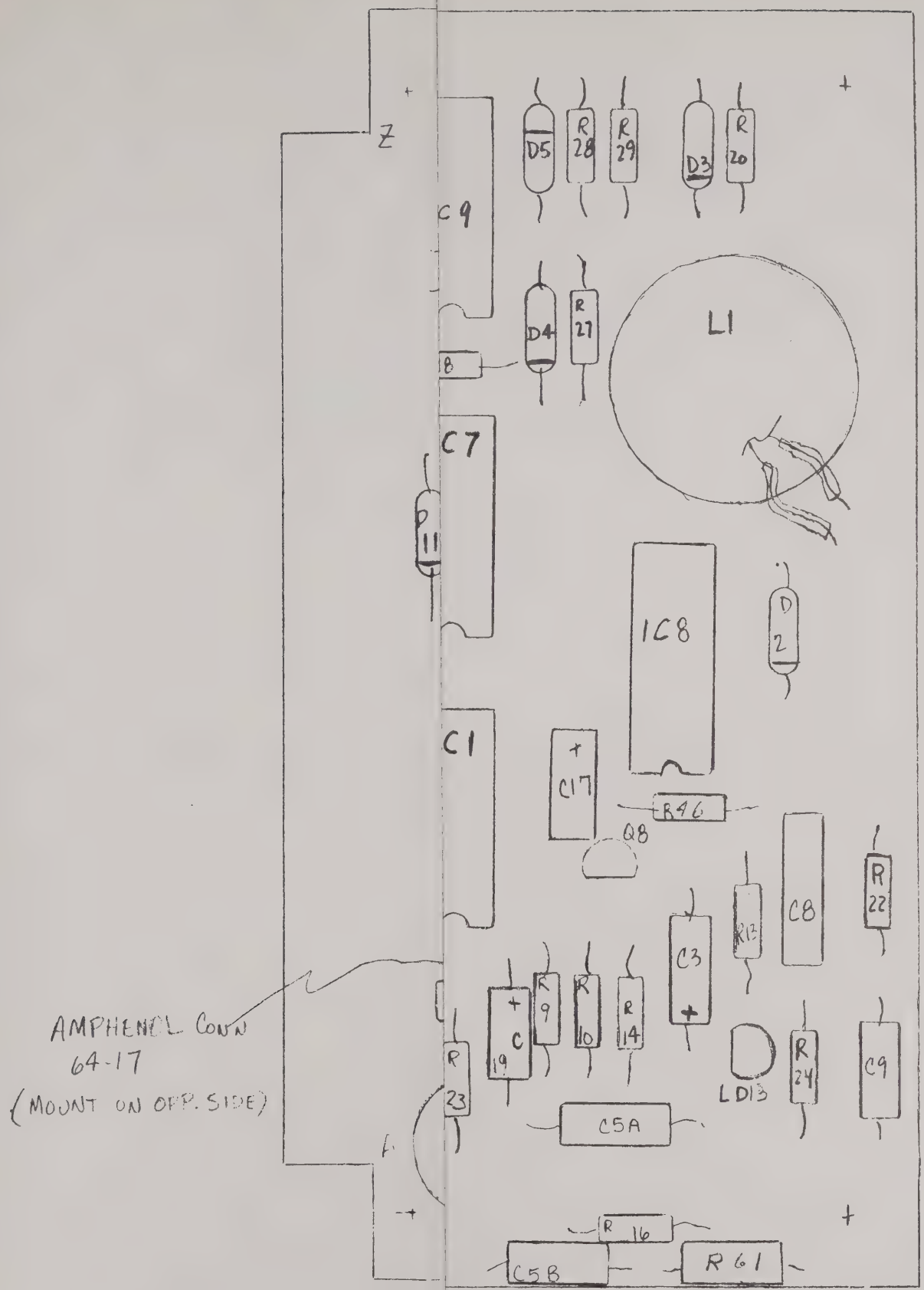


FIG. 12


Z
C9
D5
R 28
R 29
D3
R 20
D4
R 27
L1
B
C7
D 11
IC8
D 2
C1
+ C17
R46
Q8
C8
R 22
R12
C3
+
+ C 19
R 9
R 10
R 14
R 23
LD13
R 24
C9
C5A
R 16
C5B
R 61
AMPHENOL CONN
64-17
(MOUNT ON OPP. SIDE)

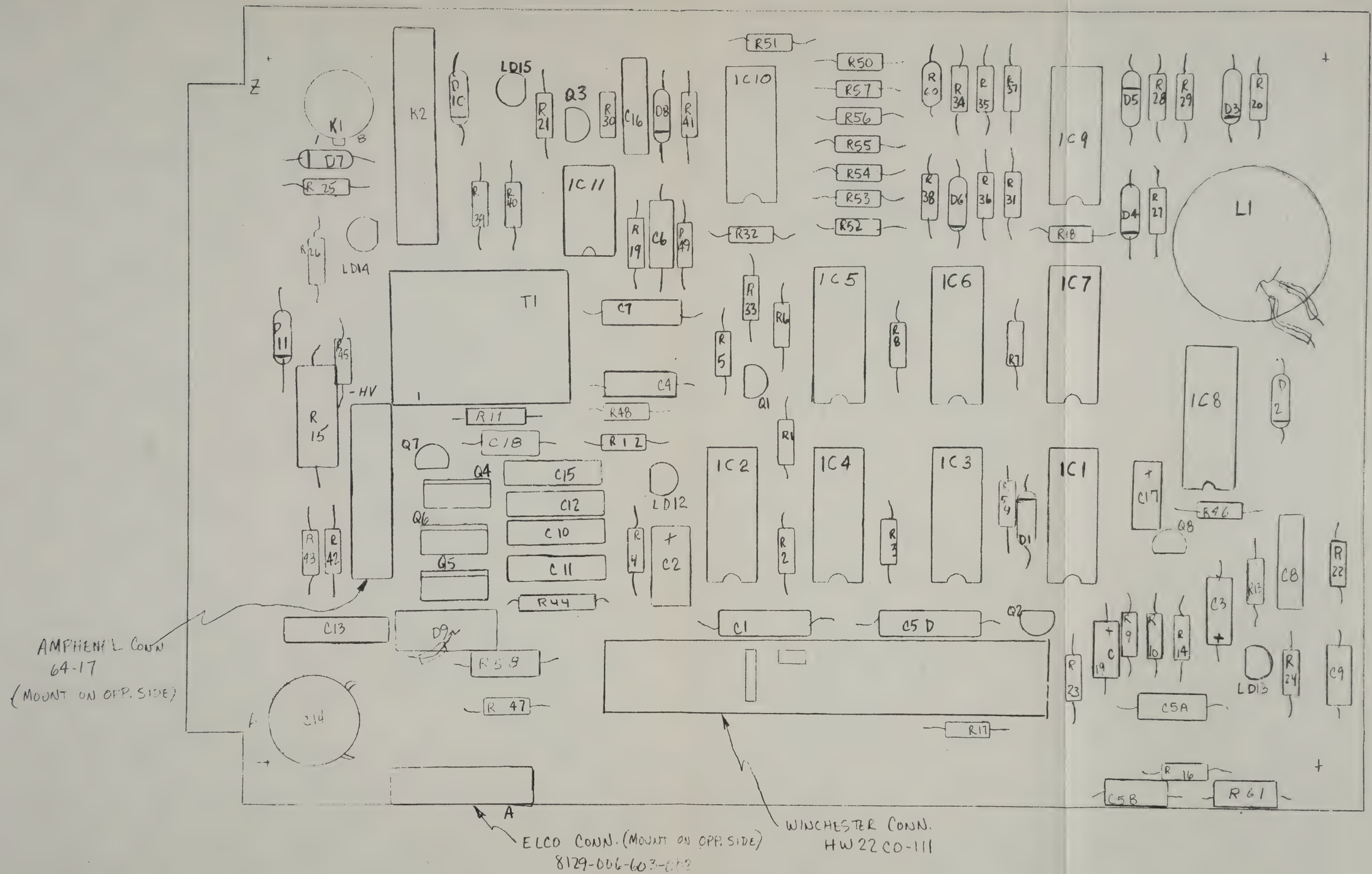
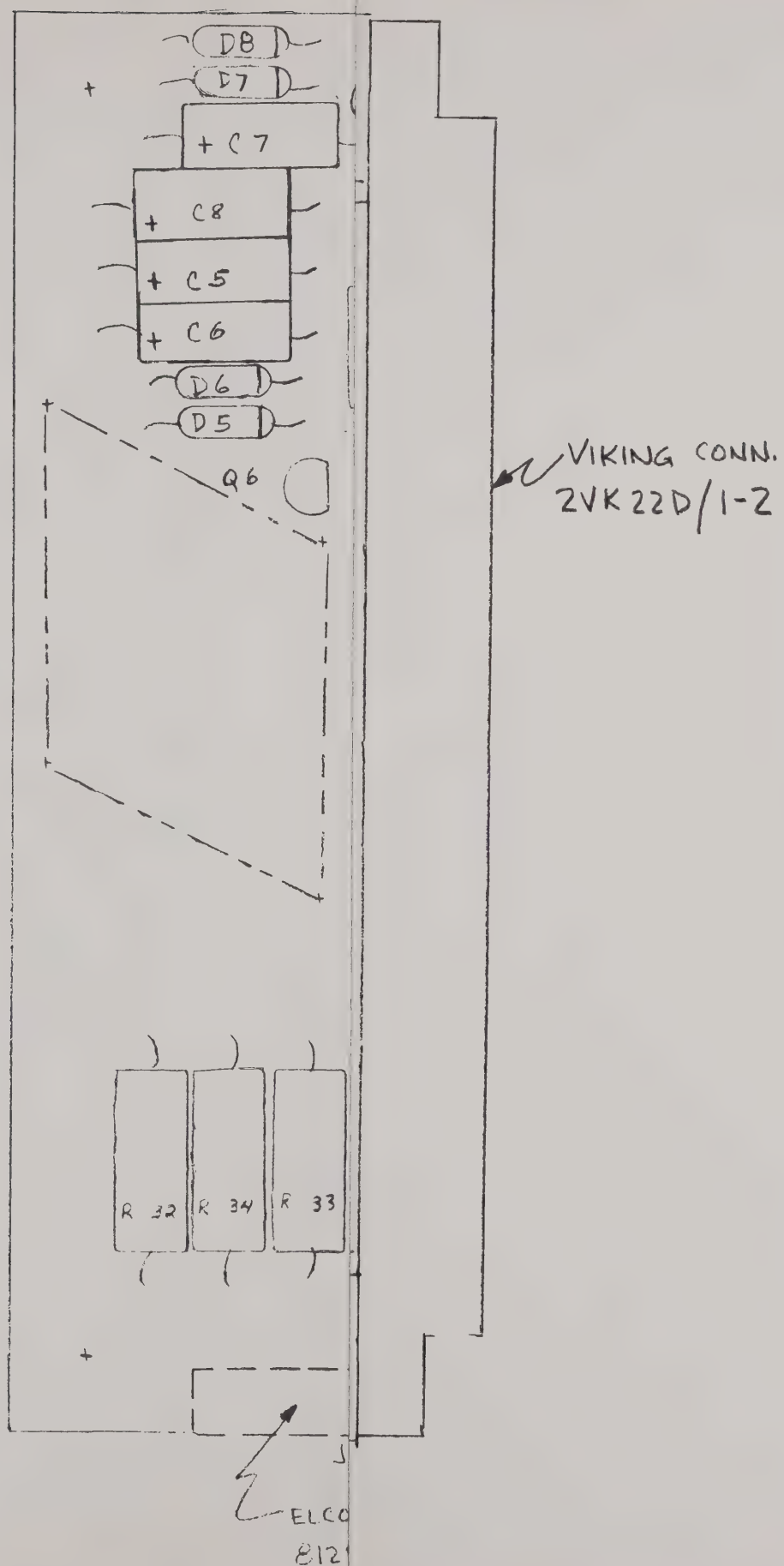

K1
K2
D7
R 25
R 26
LD14
LD15
D IC
R 21
Q3
R 30
C16
D8
R 41
R 39
R 40
IC 11
R 19
C6
R 49
T1
C7
P 11
R 45
- HV
R 15
C4
R 48
R 11
C 18
R 12
Q7
Q4
Q6
Q5
C 15
C 12
C 10
C 11
R 44
R 43
R 42
C13
D9
R 58
R 47
C14
AMPHENOL CONN
64-17
(MOUNT ON OPP. SIDE)
R 51
IC 10
R 50
R 57
R 56
R 55
R 54
R 53
R 52
R 32
R 33
R 5
R6
Q1
IC 5
R 8
IC 6
R 7
IC 7
R 60
R 34
R 35
R 37
R 38
D6
R 36
R 31
R 18
IC 9
D5
R 28
R 29
D3
R 20
D4
R 27
L1
IC 8
D 2
IC 2
IC 4
IC 3
IC 1
R 1
R 2
R 3
R 4
C2
R 54
D1
C17
R 46
Q8
C8
R 22
C3
R 13
C1
C5 D
Q2
C
R 9
R 10
R 14
R 23
LD13
R 24
C9
C5A
R 17
R 16
C5B
R 61
ELCO CONN. (MOUNT ON OPP. SIDE)
8129-006-603-[illegible]
WINCHESTER CONN.
HW 22 CO-111
A

FIG. 13


D8
D7
+ C7
+ C8
+ C5
+ C6
D6
D5
Q6
VIKING CONN.
2VK22D/1-2
R 32
R 34
R 33
ELCO
812

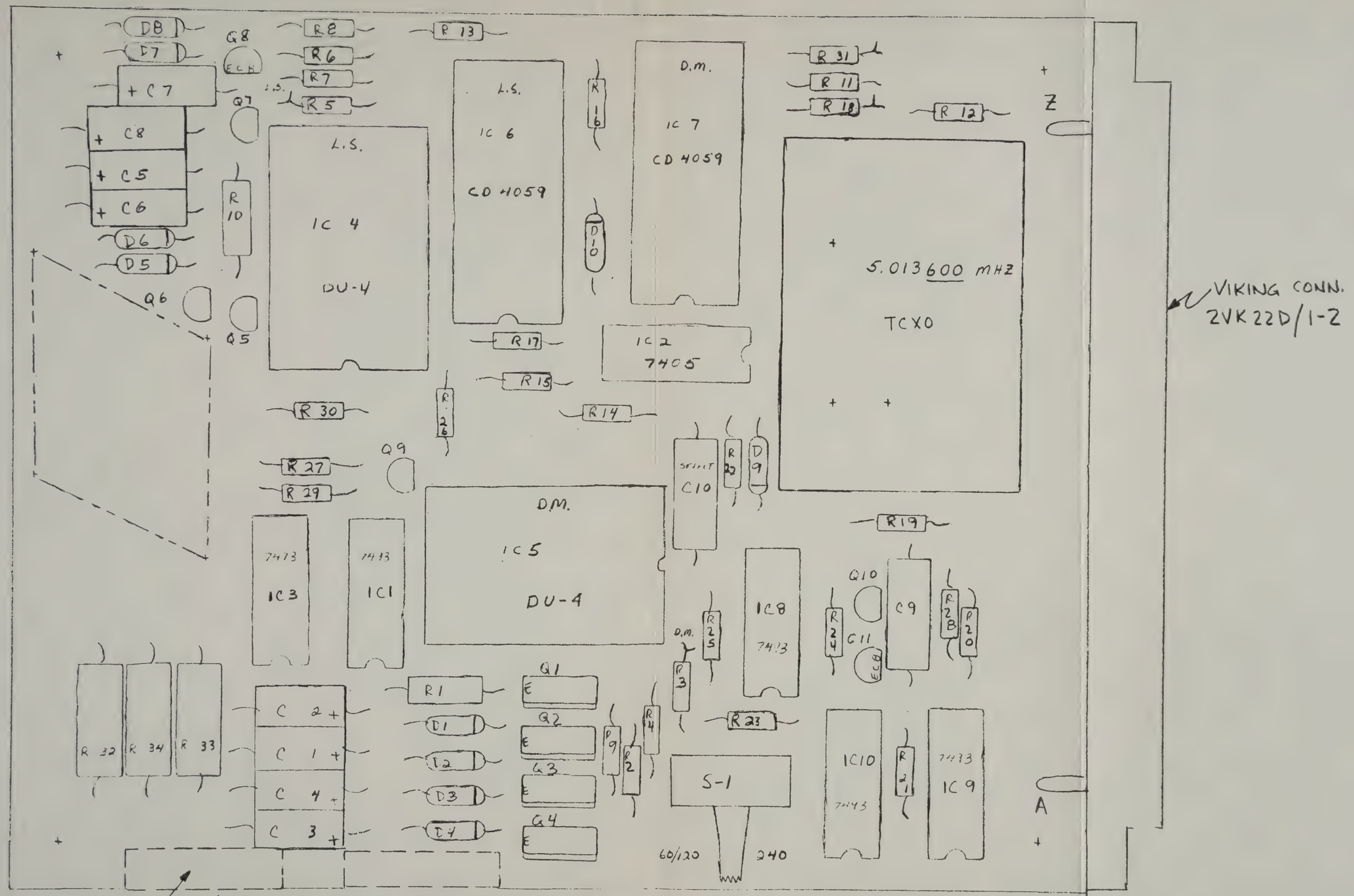

D8
D7
G8
ECB
+ C7
Q7
+ C8
+ C5
+ C6
D6
D5
R 10
Q6
Q5
L.S.
IC 4
DU-4
R8
R6
R7
R5
L.S.
R 13
L.S.
IC 6
CD 4059
R 16
D.M.
IC 7
CD 4059
D10
R 31
R 11
R 18
R 12
Z
5.013600 MHZ
TCXO
VIKING CONN.
2VK22D/1-2
R 17
IC 2
7405
R 15
R 14
R 26
R 30
Q9
R 27
R 29
D.M.
IC 5
DU-4
SELECT
C10
R 22
D9
R19
7413
IC3
7413
IC1
Q10
C9
C11
ECB
R 24
R 28
R 20
D.M.
R 25
R 3
IC8
7413
R 23
Q1
R1
D1
Q2
R2
R4
R9
C 2 +
C 1 +
C 4 +
C 3 +
R 32
R 34
R 33
D2
Q3
D3
Q4
D4
S-1
60/120
240
IC10
7413
R 21
7413
IC 9
A
J201
J202
ELCO CONN.
8129-006-603-002 (2 REQ'D)

FIG. 13A

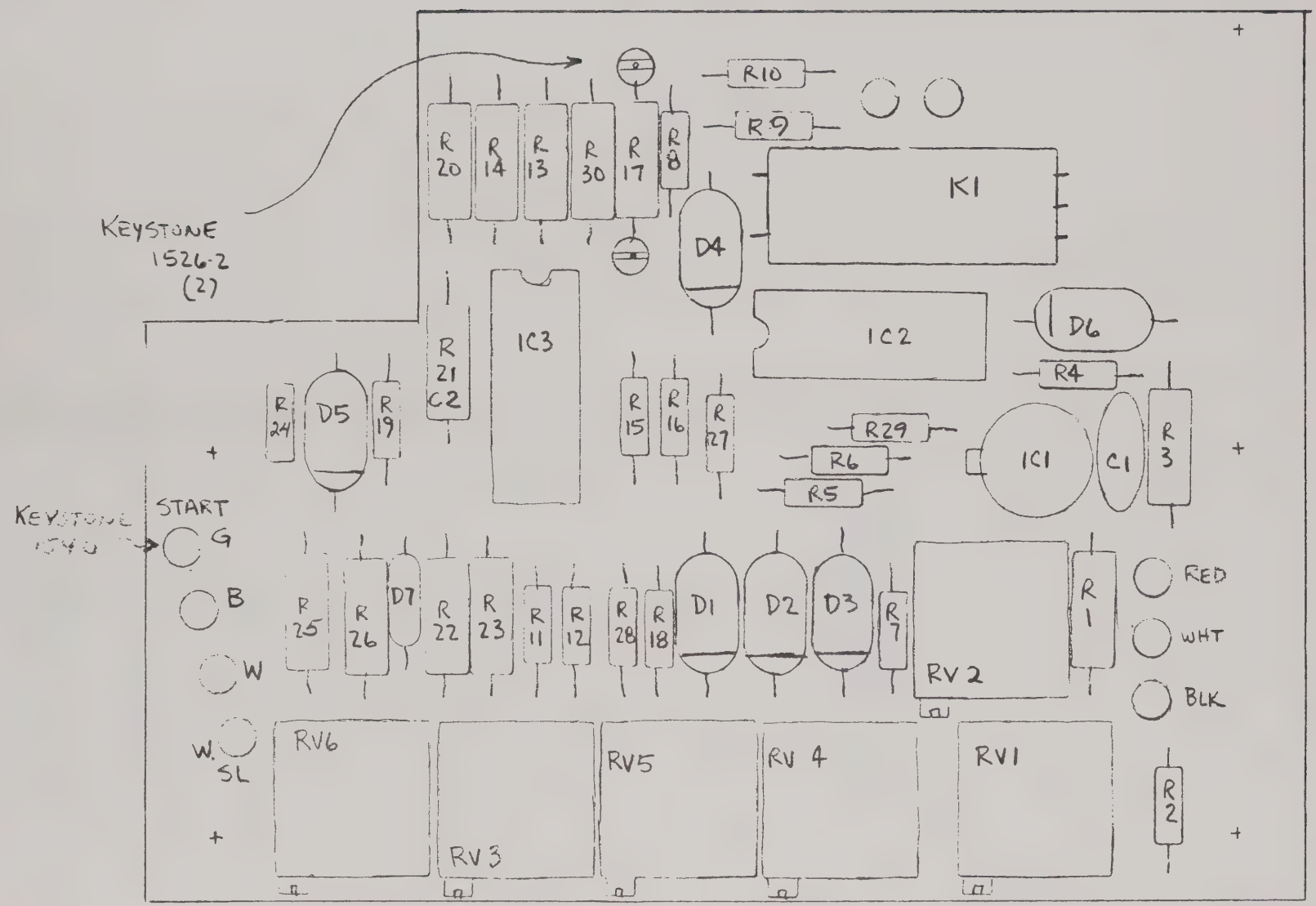
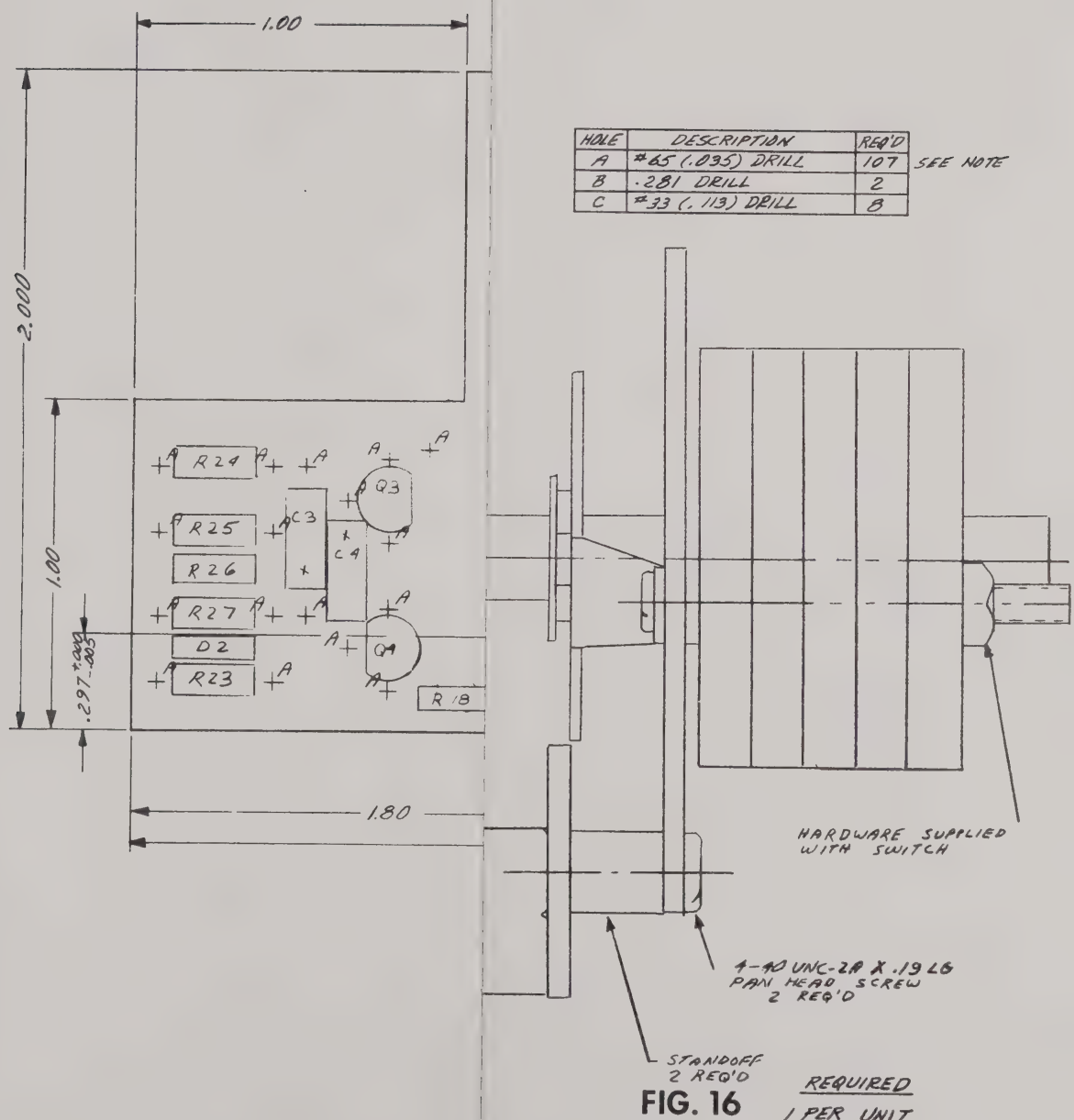

KEYSTONE
1526-2
(2)
KEYSTONE
1540
START
G
B
W
W.
SL
R10
R9
R
20
R
14
R
13
R
30
R
17
R
8
K1
D4
IC2
D6
R4
R
21
C2
IC3
R
24
D5
R
19
R
15
R
16
R
27
R29
R6
R5
IC1
C1
R
3
R
25
R
26
D7
R
22
R
23
R
11
R
12
R
28
R
18
D1
D2
D3
R
7
RV 2
R
1
RED
WHT
BLK
RV6
RV3
RV5
RV 4
RV1
R
2

FIG. 13B

NOTES:
ALL "A" HOLES TO BE PLATED THROUGH.



HOLE	DESCRIPTION	REQ'D
A	#65 (.035) DRILL	107
B	.281 DRILL	2
C	#33 (.113) DRILL	8

SEE NOTE

FIG. 16

REQUIRED
1 PER UNIT

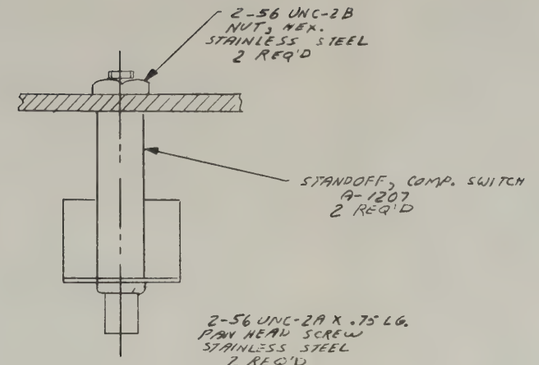
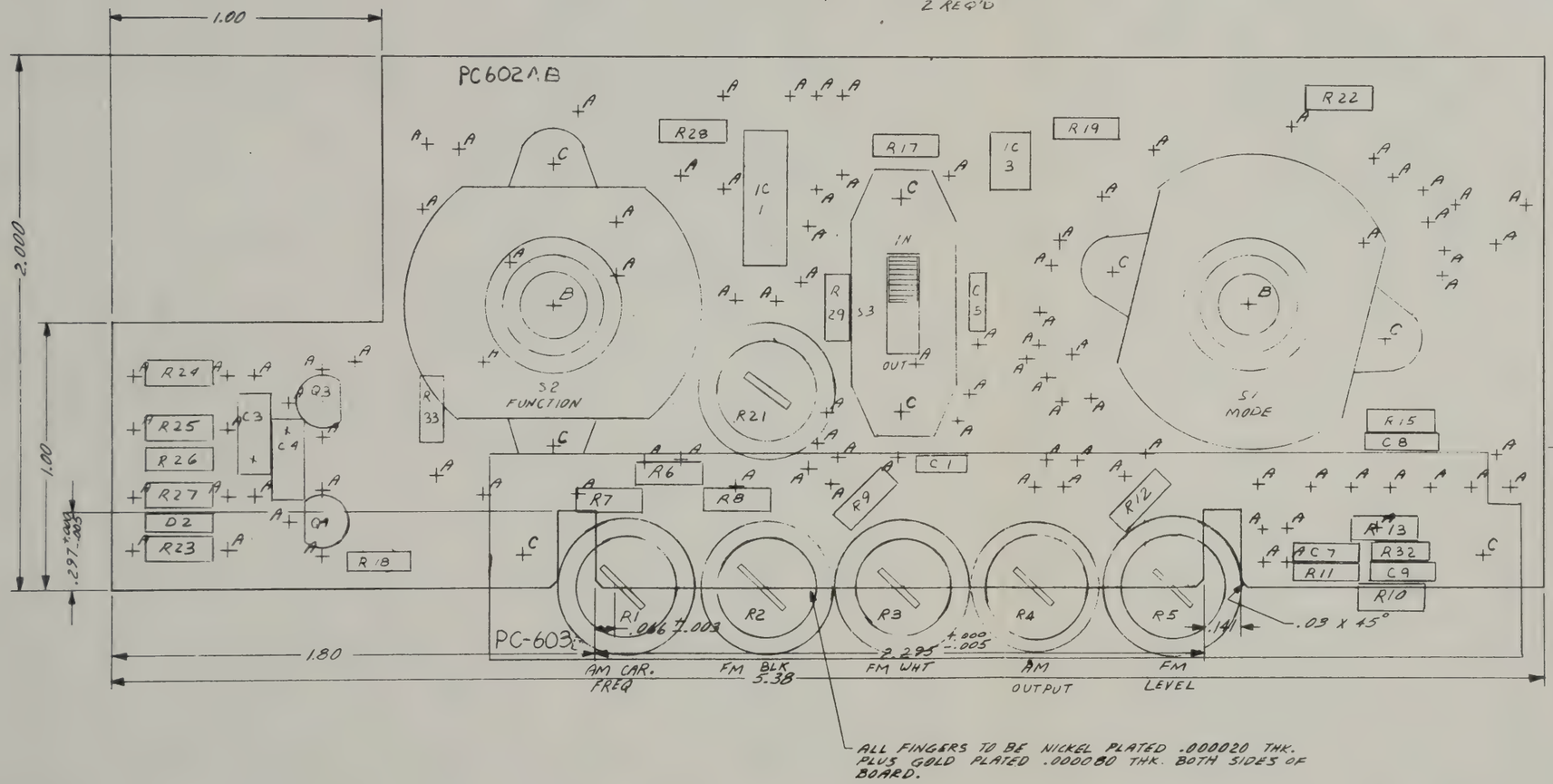


FIG. 15



COMPONENT SIDE

FIG. 14

NOTES:
ALL "A" HOLES TO BE PLATED THROUGH.

HOLE	DESCRIPTION	REQ'D
A	#65 (.035) DRILL	107
B	.281 DRILL	2
C	#33 (.113) DRILL	8

SEE NOTE

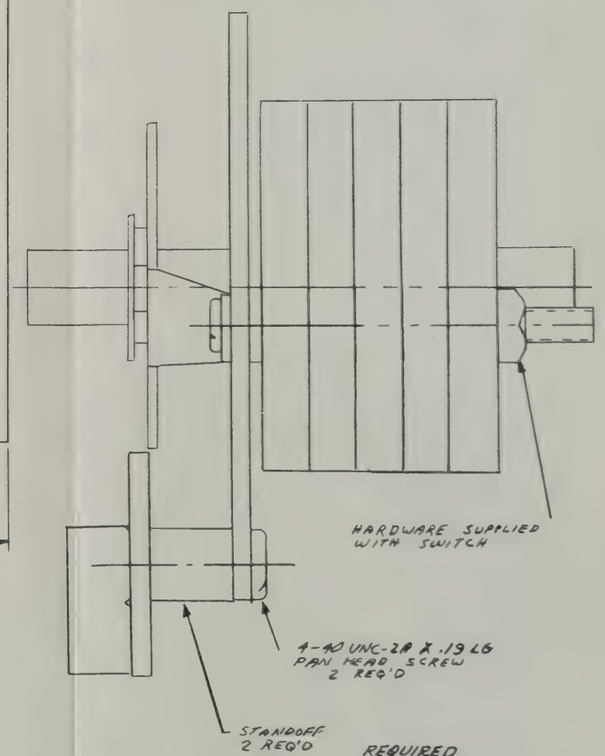


FIG. 16

REQUIRED
1 PER UNIT

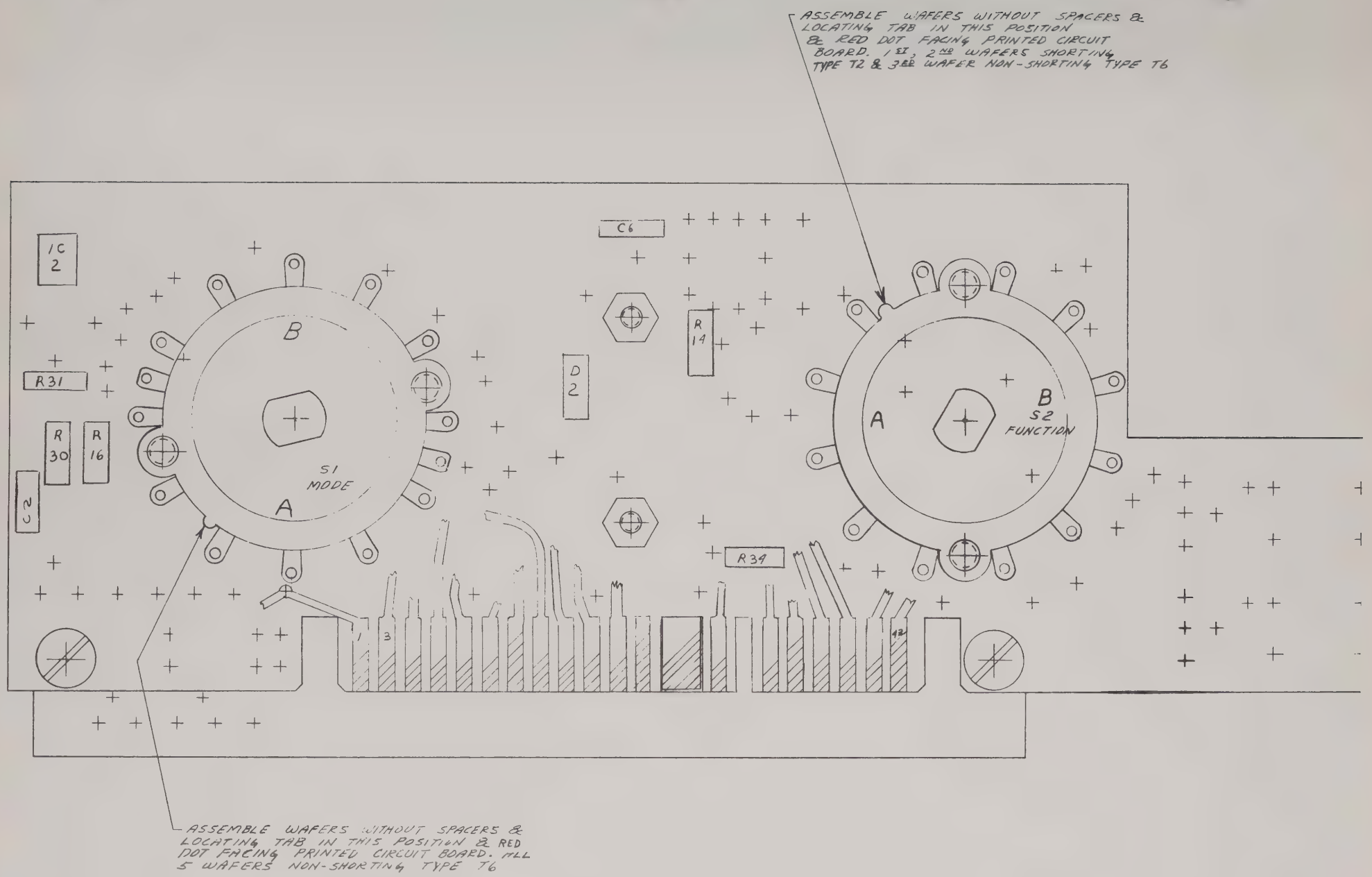
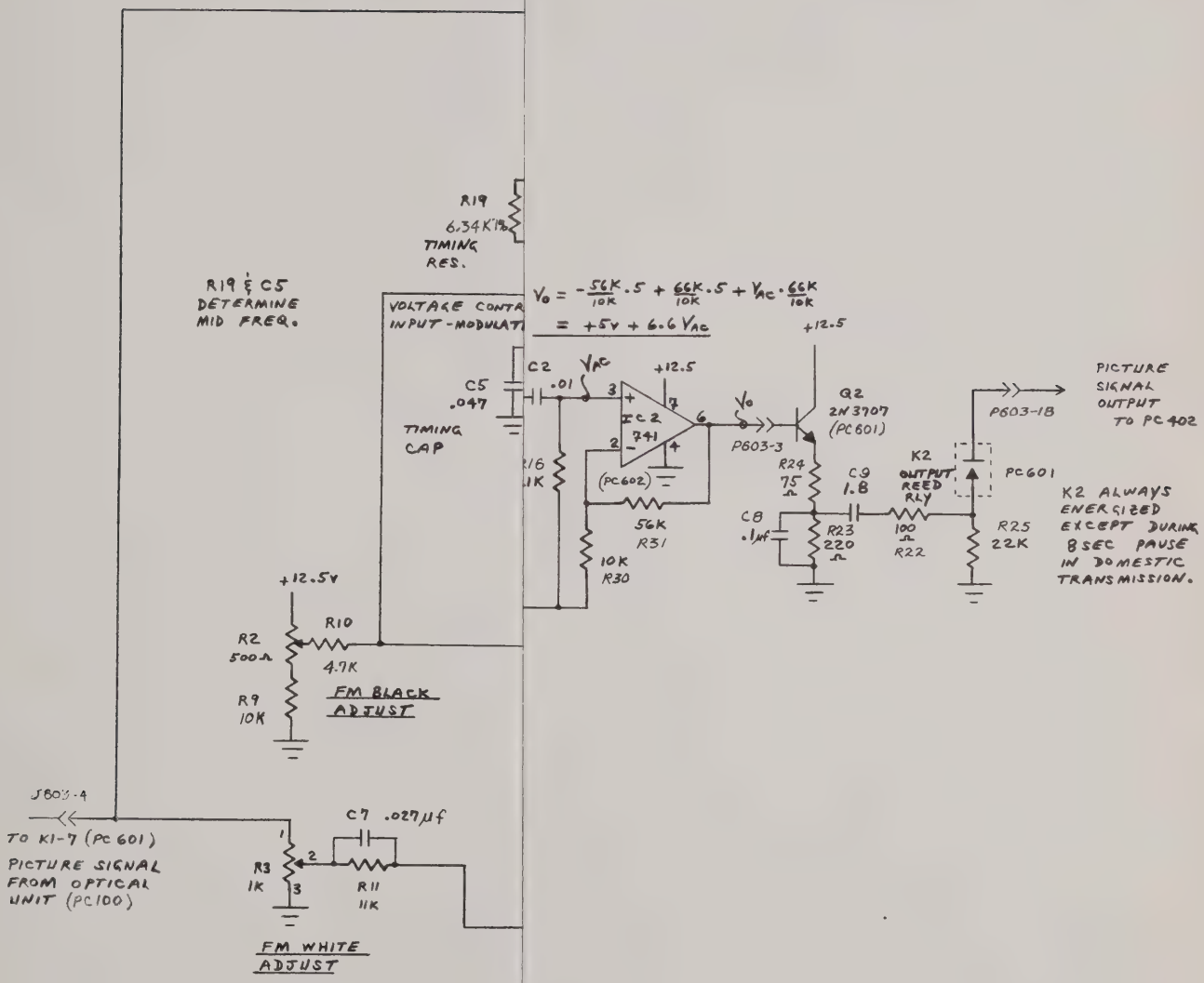


FIG. 17

VIEW A-A


R19
6.34K 1%
TIMING RES.
R19 & C5 DETERMINE MID FREQ.
VOLTAGE CONTR
INPUT - MODULATI
$V_o = -\frac{56K}{10K} \cdot .5 + \frac{66K}{10K} \cdot .5 + V_{AC} \cdot \frac{66K}{10K}$
$= +5v + 6.6\,V_{AC}$
+12.5
C2
.01
V_{AC}
C5
.047
TIMING CAP
IC 2
741
(PC602)
V_o
P603-3
Q2
2N3707
(PC601)
R24
75
C9
1.8
C8
.1μf
R23
220
56K
R31
10K
R30
K2
OUTPUT REED RLY
PC601
100
R22
R25
22K
P603-1B
PICTURE SIGNAL OUTPUT TO PC402
K2 ALWAYS ENERGIZED EXCEPT DURING 8 SEC PAUSE IN DOMESTIC TRANSMISSION.
+12.5v
R10
4.7K
R2
500Ω
R9
10K
FM BLACK ADJUST
J803-4
TO K1-7 (PC601)
PICTURE SIGNAL FROM OPTICAL UNIT (PC100)
C7 .027μf
R3
1K
R11
11K
FM WHITE ADJUST

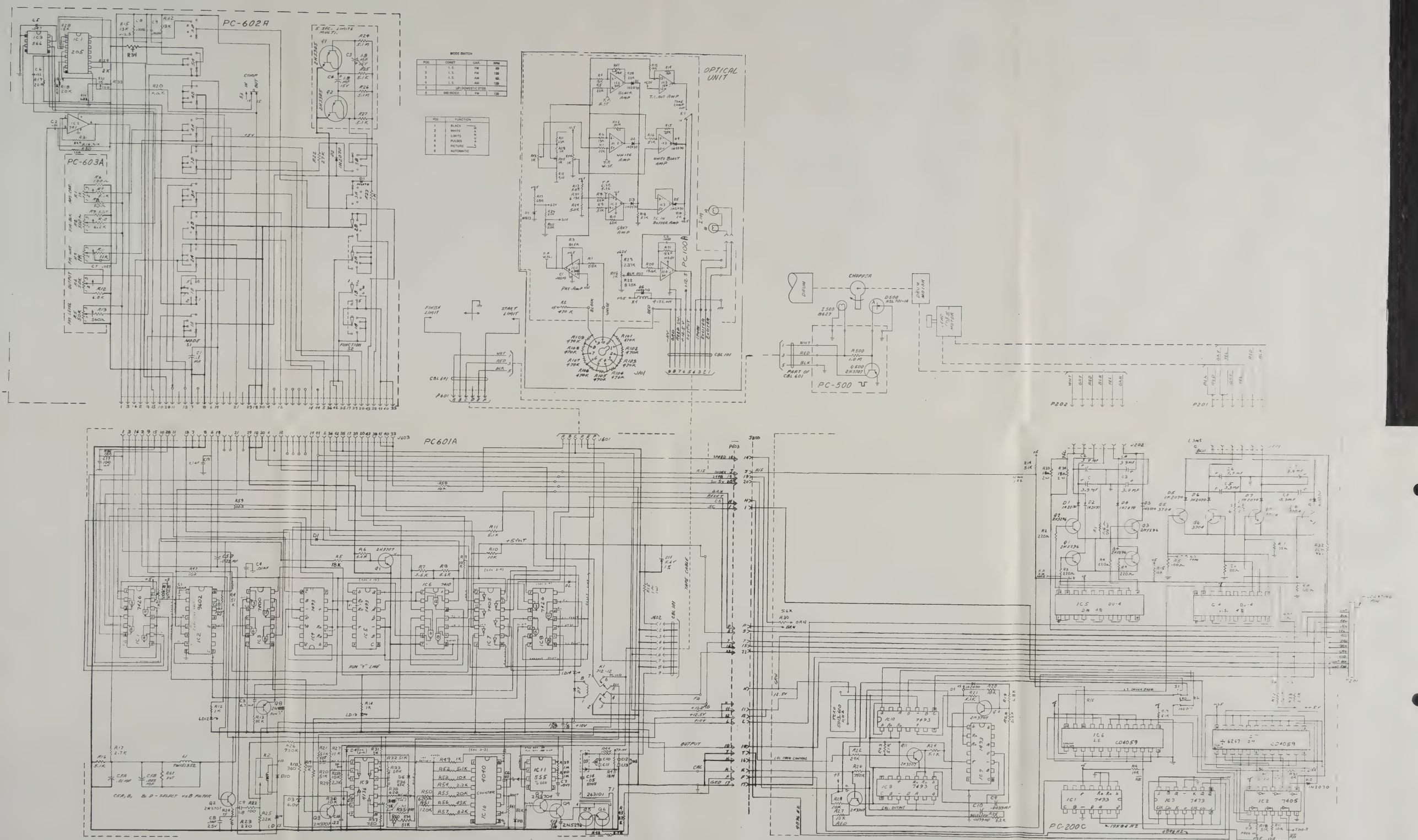
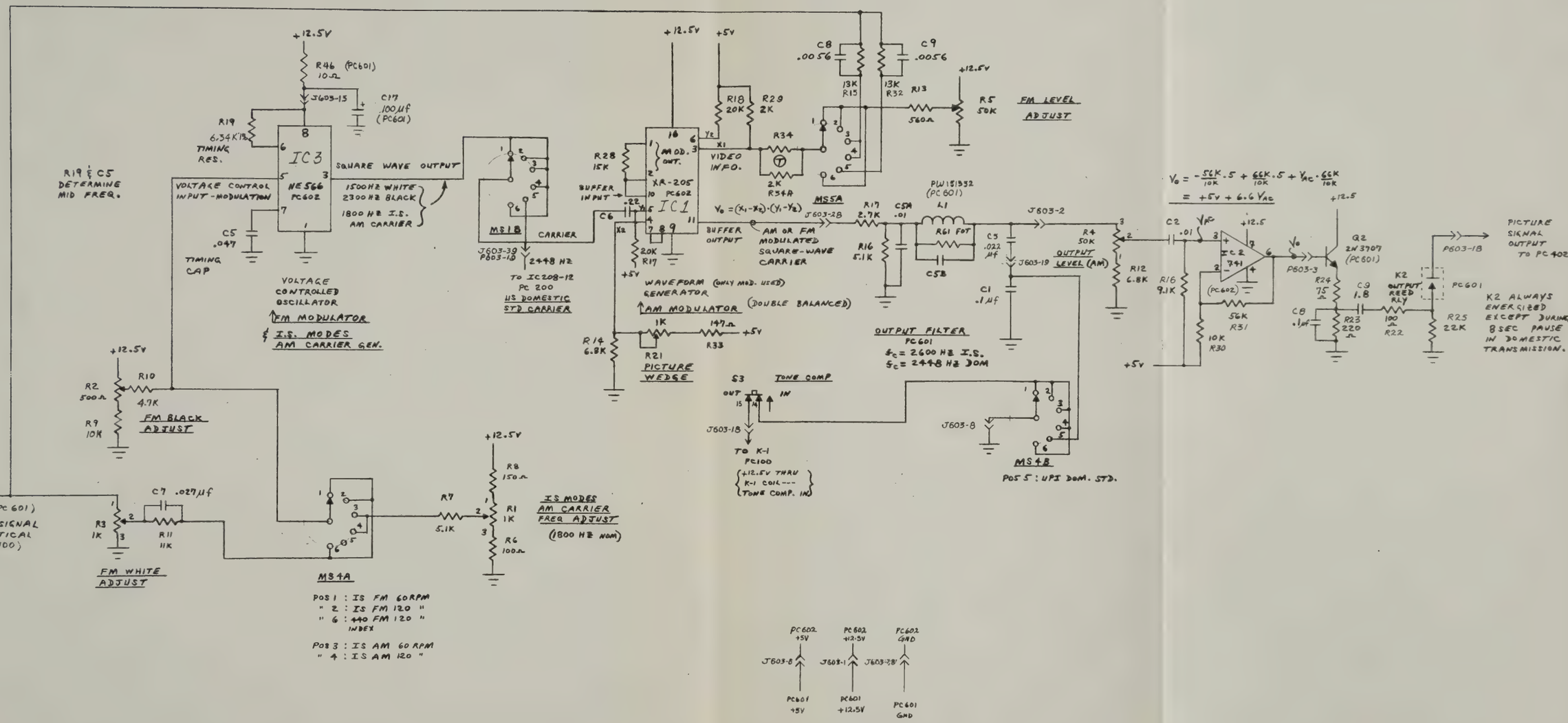


FIG. 18

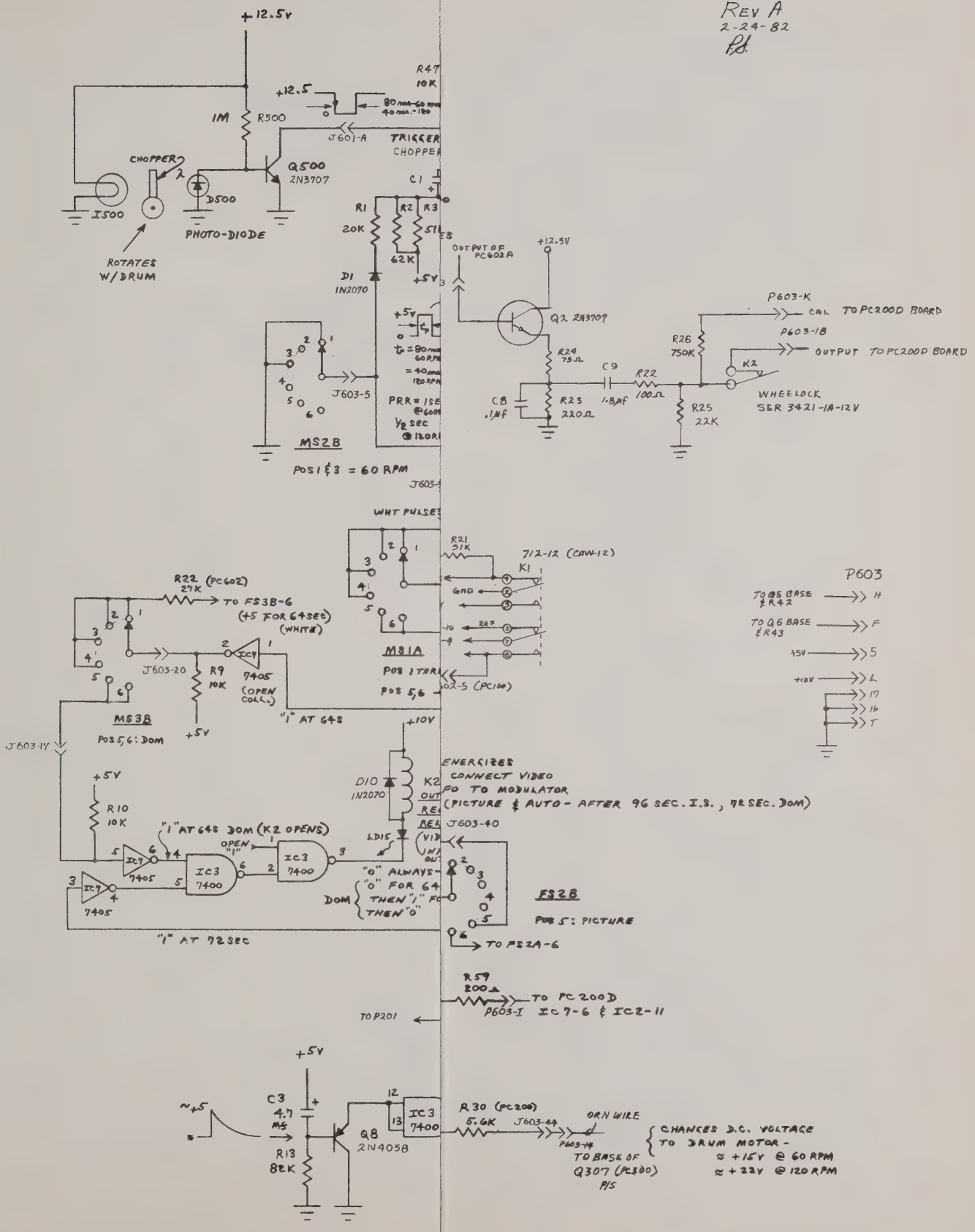
SYSTEM SCHEMATIC PART A
TELEPHOTO SCANNER TYPE 16-S-D F/2
UNITED PRESS INTERNATIONAL

AM & FM MODULATORS (REF. PC601 & PC602)

REV A. 2-24-82 P.S.



REV A
2-24-82
PS



CHOPPER, AUTOMATIC PROGRAM CONTROL, RESET CKTS.

(REF. PC 601, PC 602)

REV A
2-24-82
PS

J603

C17 100 µF — 10Ω R46 — 12.5V FOR N.V. Sec. — P603-12 — P603-N

C19 4.7 µF — TO CSO — TO VSB FIL. — R17 VSB FIL. — +5V — J602-7 — P603-J INDEX — +12.5V — J601-C — J602-6 — P603-11

P603-20 — IC9-4 — R19 100K — "0" = BLK "1" = WHT

R58 10Ω — IC10-15 & TERM OF C18, COL. OF Q4 & Q7 (12.5V)

IC2 SECTION 1 — PULSE SHAPER

SECTION 2 — IS MISSING PULSE DETECTOR (RE-TRIGGERABLE MONO)

+12.5V — 1M R500 — Q500 2N3707 — D500 PHOTO-DIODE — I500 — CHOPPER — ROTATES W/DRUM

+12.5 — 80 MIN-60 MAX / 40 MIN-120 MAX — J601-A — TRIGGER 1 CHOPPER

+5V — R47 10K — R4 51K — C2 100MS — DUAL MONO IC2 PC601 9602 — C1 10 MS — R1 20K — R2 62K — R3 51K — D1 IN2070

PULSE IF DRUM DOES NOT ROTATE — IC8 7426 — "0" = RESET — OPEN COLL. OUTPUTS — PC601 "1" IN AUTO

"0" = RESET — P603-15

TO BASE OF Q 302 ON PWR. SPLY. - PC 300 "RESET" SHUTS OFF +5V & +12.5V SUPPLIES (GRAY WIRE)

TO IC1-1 — IC3 7400 — J603-42

R23 1K — +5V — FS2A — GROUND THRU FS 2B — POS 6 → AUTO

START LIMIT CONTACTS CLOSED @ LIMIT — J601-F — IC7 7405 — IC8 7426

FINISH LIMIT — J601-B — IC7 7405 — IC8 7426

R12 1K — LD 12 — +5V — J603-5 — MS2B — POS 1 & 3 = 60 RPM

T_D = 80 msec 60 RPM = 40 msec 120 RPM — PRR = 1 SEC @ 60RPM — ½ SEC @ 120RPM — BRAKING PULSE

WHT PULSES — J603-9 — J603-10 — BLK PULSES — To FS3B-4 "PULSES" +5V = WHITE 0V = BLACK

R7 5.6K — R5 18K — 5.6K — R8 5.6K — Q1 2N3707 — +5V

"0" - 60 RPM "1" - 120 RPM — IC6 7410 — ½ PRR

PRR = 1/2 SEC - 120 RPM — IC6 7410 — IC5 7493 — (A) Q0 — (B) Q1 — (D) Q3 — @ 4 SEC — MR1, MR2 (R0)

R22 (PC602) 27K — TO FS3B-6 (+5 FOR 64 SEC) (WHITE) — J603-20 — R9 10K — IC9 7405 (OPEN COLL.) — MS3B — POS 5,6: 30M

"1" AT 64S — "1" @ START/SEND "0" @ 100S I.S. @ 76S 30M. (COUNTERS STOP) — "1" AT 100S I.S. AT 76S 30M.

+10V — D10 IN2070 — K2 OUTPUT REED RELAY (VIDEO INFO OUT) — LD15 — J603-14 — J603-13 — J603-11 — MS3A — POS 1 THRU 4: I.S. POS 5,6: 30M.

"1" AT 64S 30M (K2 OPENS) — OPEN "1" — IC3 7400 — IC9 7405 — "0" ALWAYS - I.S. "0" FOR 64S THEN "1" FOR 8 SEC THEN "0" — 30M

"1" AT 72 SEC

@ 8 SEC — @ 64 SEC — @ 32 SEC — IC4 7493 — (A) Q0 — (B) Q1 — (C) Q2 — (D) Q3 — MR1, MR2 (R0) — "1" = RESET "0" = COUNT (AUTO ONLY)

P603-P J203-P — TO P201 — R11 5.1K — TO IC3-10 MANUAL = "1" AUTO = "0" BY MEANS OF FS2A & J603-42 — IC1 7426 — ALWAYS "1" IN MANUAL

RUN "1" LINE — "0" @ PWR. ON UNTIL (72 SEC) C3 CHARGES - TURNING ON Q8 - THEN RUN "1" LINE = "1". (ALLOWS IC4 & IC5 TIME TO RESET)

C3 4.7 MF — R13 82K — Q8 2N4058 — IC3 7400 — R14 1K — LD13

J603-16 — "RUN 1"

(DRUM MOTOR) SPEED CONTROL LINE — IC1 7426 — "0" = 120 RPM "1" = 60 RPM — R30 (PC200) 5.6K — J603-48 — GRN WIRE — P603-M — TO BASE OF Q307 (PC300) P/S — CHANGES D.C. VOLTAGE TO DRUM MOTOR - ≈ +15V @ 60 RPM ≈ +22V @ 120 RPM

(DRUM MOTOR) SPEED CHANGE LINE - SC — IC1 7426 — "0" = 120 RPM "1" = 60 RPM — R59 200Ω — TO PC 200D P603-I IC 7-6 & IC2-11

J603-21 — MS2A — POS 1,3: 60 RPM POS 2,4,5,6: 120 RPM

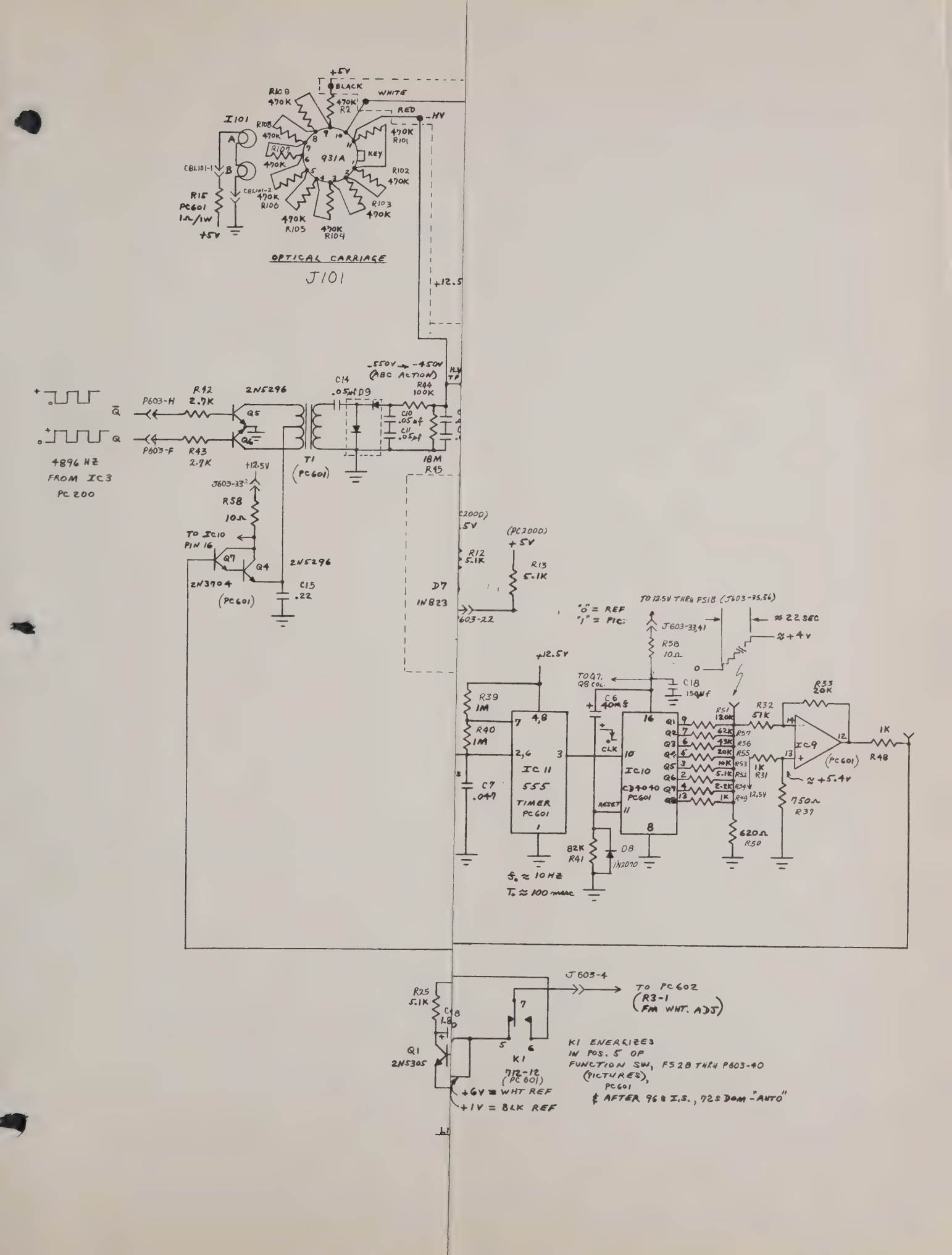
OUTPUT OF PC602A — J603-3 — +12.5V — Q2 2N3707 — R24 75Ω — C8 .1µF — R23 220Ω — C9 1.8µF — R22 100Ω — R26 750K — R25 22K — P603-K CAL TO PC200D BOARD — P603-18 OUTPUT TO PC200D BOARD — K2 — WHEELOCK SER 3421-1A-12V

Q3 — R21 51K — 7/12-12 (COM-12) — K1 — P603-22 — GND — P603-Y — IC9-10 — J603-9 — Q3-COL — J602-5 (PC100)

P603 — TO Q5 BASE & R42 — TO Q6 BASE & R43 — +5V — +30V — H F 5 L 17 16 T

+10V — D7 IN2070 — K1 ENERGIZES TO CONNECT VIDEO INFO TO MODULATOR (PICTURE & AUTO - AFTER 96 SEC. I.S., 72 SEC. 30M)

IC8 7426 — D2 — "0" AT 96 SEC. I.S. 72 SEC. 30M — J603-40 — FS2B — POS 5: PICTURE — TO FS2A-6


+5V
BLACK
WHITE
RED
-HV
R109 470K
470K R2
I101
R108 470K
R107 470K
R106 470K
R105 470K
R104 470K
R103 470K
R102 470K
470K R101
KEY
931A
CBL101-1
CBL101-2
R15 PC601 1.2Ω/1W
OPTICAL CARRIAGE
J101
+12.5
-550V → -450V (ABC ACTION)
H.V. TP
C14 .05μf D9
R44 100K
C10 .05μf
C11 .05μf
18M R45
P603-H
R42 2.7K
2N5296
Q5
Q6
P603-F
R43 2.7K
4896 HZ FROM IC3 PC 200
T1 (PC601)
+12.5V
J603-33
R58 10Ω
TO IC10 PIN 16
Q7
Q4
2N5296
2N3704
C15 .22
(PC601)
(PC2000)
+5V
R12 5.1K
R13 5.1K
D7 IN823
J603-22
"0" = REF
"1" = PIC
TO 12.5V THRU FS1B (J603-35,36)
J603-33,41
≈ 22 SEC
≈ +4V
TO Q7, Q8 COL.
C18 150μf
R39 1M
R40 1M
C7 .047
IC 11 555 TIMER PC601
C6 40μf
CLK
IC10 CD4040 PC601
RESET
82K R41
D8 IN2070
f₀ ≈ 10 HZ
T₀ ≈ 100 msec
R51 120K
R32 51K
R57 62K
R56 43K
R55 20K
R53 10K
R52 5.1K
R34 2.2K
R49 1K
12.5V
R33 20K
IC9
(PC601)
1K R31
≈ +5.4V
750Ω R37
620Ω R50
1K R48
J603-4
To PC602 (R3-1 FM WHT. ADJ)
R25 5.1K
C18 1.8μ
Q1 2N5305
K1 712-12 (PC601)
+6V = WHT REF
+1V = BLK REF
K1 ENERGIZES IN POS. 5 OF FUNCTION SW, FS2B THRU P603-40 (PICTURES), PC601
& AFTER 968 I.S., 725 DOM "AUTO"

16S XMTR — PHOTOCELL AMP & ABC CIRCUITS (REF. PC100, PC601, PC602)

REV. A 2-28-82 PA

PC100A

OPTICAL CARRIAGE J101

LM308 PRE-AMP PC100

LM324 -1/4 BLACK AMP W.SL. = 3-4v

BUFFER AMP PC100

WHITE AMP W.SL. = 7-9v

GREY AMP W.SL. = 4-7v

WHITE BOOST AMP LM124 -1/4

TC OUT AMP

PICTURE OUTPUT AMP (PC100A)

ADJ. FOR +1V OUT W/BLACK & TONE COMP. OUT.

4896 HZ FROM IC3 PC 200

T1 (PC601)

ENERGIZE FOR TONE COMP OUT (DOES NOT INTERGIZE IN MODE 5

PC 602

MS48

CHOPPER PULSE FROM IC2-4 (PC601)

CHANGE TO 1K! INSURES PIN 5 DROPS BELOW +6V

RC4136 -1/4 (PC601)

IC 11 555 TIMER PC601

IC10 CD4040 PC601

IC9 (PC601)

TO 135V THRU FS1B (J603-35,36)

≈ 22.5Sc

≈ +4v

≈ +5.4v

$T_1 = T_2 = .5S$

LIMITS MULTI (PC602)

PULSES SYNCH W/CHOPPER OUTPUT (1 PULSE/DRUM ROTATION)

FS3B FUNCTION SWITCH PC-602

POS 1: BLACK
" 2: WHITE
" 3: LIMITS
" 4: PULSES
" 5: PICTURE
" 6: AUTO

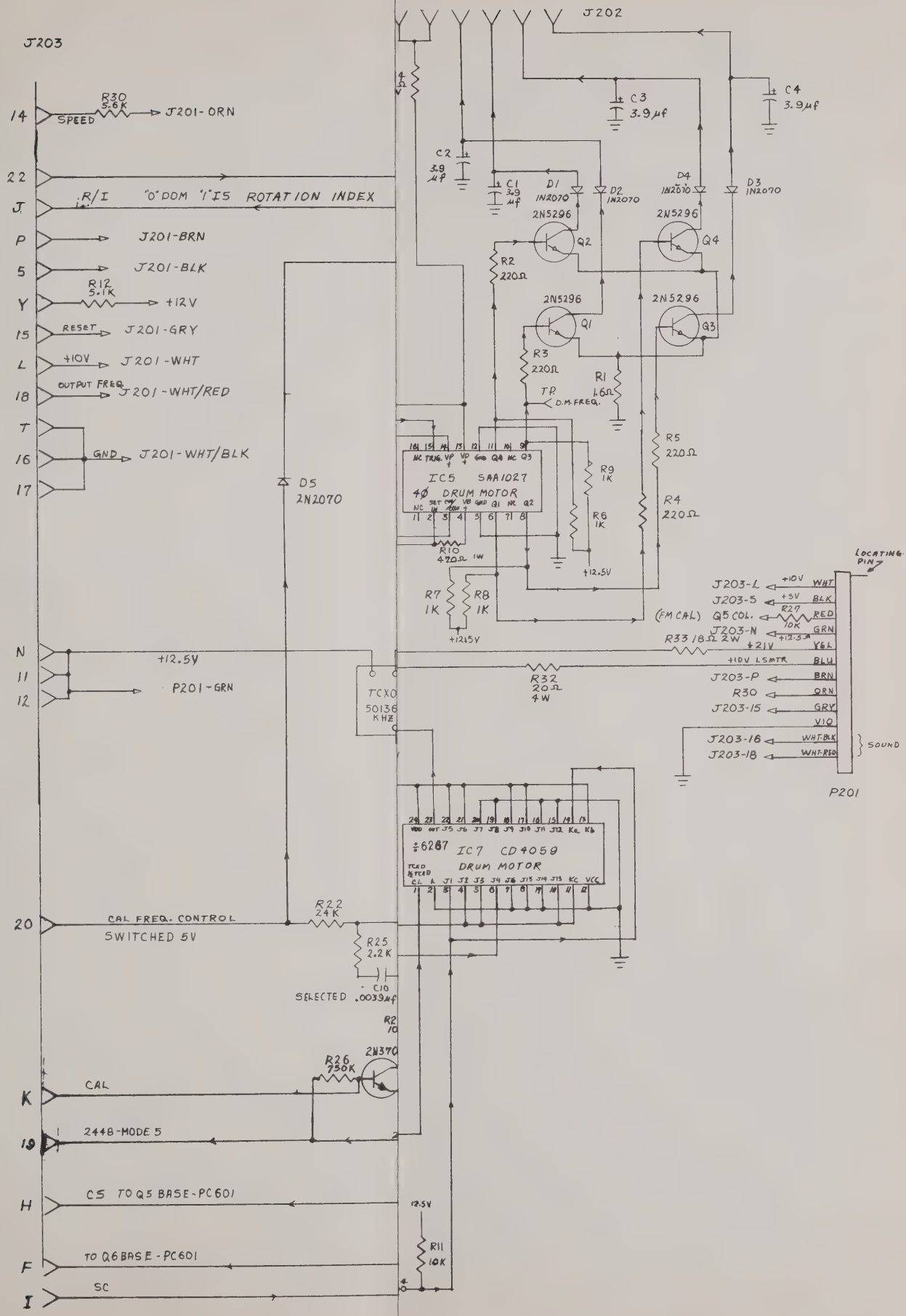
0V = BLACK
+5V = WHITE

K1 ENERGIZES IN POS. 5 OF FUNCTION SW, FS2B THRU P603-40 (PICTURES), PC601 & AFTER 96 I.S., 92 DOM - "AUTO"

+6V = WHT REF
+1V = BLK REF

TO PC602 (R3-1 FM WHT. ADJ)

"0" = REF
"1" = PIC


J203
J202
14
SPEED
R30 5.6K
J201-ORN
22
J
R/I "0" DOM "1" IS ROTATION INDEX
P
J201-BRN
5
J201-BLK
Y
R12 5.1K
+12V
15
RESET
J201-GRY
L
+10V
J201-WHT
18
OUTPUT FREQ.
J201-WHT/RED
T
16
17
GND
J201-WHT/BLK
D5 2N2070
C2 3.9 µf
C1 3.9 µf
C3 3.9µf
C4 3.9µf
D1 IN2070
D2 IN2070
D4 IN2070
D3 IN2070
2N5296 Q2
2N5296 Q4
2N5296 Q1
2N5296 Q3
R2 220Ω
R3 220Ω
R1 1.6Ω
TP D.M. FREQ.
R5 220Ω
R4 220Ω
IC5 SAA1027
4Ø DRUM MOTOR
R9 1K
R6 1K
R10 470Ω 1W
R7 1K
R8 1K
+12.5V
N
11
12
+12.5V
P201-GRN
TCXO 50136 KHZ
R32 20Ω 4W
R33 18Ω 2W
LOCATING PIN
J203-L +10V WHT
J203-5 +5V BLK
R27 10K
(FM CAL) Q5 COL. RED
J203-N +12.3V GRN
+21V YEL
+10V LSMTR BLU
J203-P BRN
R30 ORN
J203-15 GRY
VIO
J203-16 WHT-BLK
J203-18 WHT-RED
SOUND
P201
IC7 CD4059
DRUM MOTOR
÷6287
20
CAL FREQ. CONTROL
SWITCHED 5V
R22 24K
R25 2.2K
C10 .0039µf
SELECTED
R26 750K
2N3704
K
CAL
19
2448-MODE 5
H
CS TO Q5 BASE-PC601
F
TO Q6 BASE-PC601
I
SC
12.5V
R11 10K

J203

J201

J202

14 — R30 5.6K SPEED → J201-ORN

22

J — R/I "0" DOM "1" IS ROTATION INDEX

P → J201-BRN

5 → J201-BLK

Y — R12 5.1K → +12V

15 — RESET → J201-GRY

L — +10V → J201-WHT

18 — OUTPUT FREQ → J201-WHT/RED

T

16 — GND → J201-WHT/BLK

17

D5 2N2070

+5V

R19 6.8K

R20 10K

R21 5.1K

Q8

R28 2.2K

C9 .0039μf

IC9 7493A

N — +12.5V → P201-GRN

11

12

TCXO 5013600 KHZ

IC10 7493A

20 — CAL FREQ. CONTROL SWITCHED 5V

R22 24K

R25 2.2K

C10 SELECTED .0039μf

R23 51K

R24 5.1K

Q7 2N3707

R29 10K

R26 750K

2N3707 Q5 → P201 RED

IC8 7493A

K — CAL

19 — 2448-MODE 5

2448 HZ CAL: OUTPUT

H — C5 TO Q5 BASE-PC601

F — TO Q6 BASE-PC601

I — SC

C6 3.9μf

C5 3.9μf

C8 3.9μf

C7 3.9μf

+12.5V

4Ø IC4 SAA1027 LEAD SCREW

R13 5.1K

R36 470Ω 1W

R14 5.1K

D6 1N914

12.5V

R37 10K

IC2

R35 10K

R17 5.1K

R11

IC6 CD4059 LEAD SCREW

÷6287

IC7 CD4059 DRUM MOTOR

C11 .1μf

240HZ

S1 (÷10)

60/120 HZ (÷1)

FREQ. IN T.P

R18 1K

12.5V

R16 10K

R12

IC1 7493A

IC3 7473

IC3 7473

19584 HZ

4896 HZ

4996 HZ

SPEED CONTROL "1"=60 "0"=120

R34 18Ω 2W

C3 3.9μf

C4 3.9μf

C2 .39 μf

C1 .39 μf

D1 1N2070

D2 1N2070

D4 1N2070

D3 1N2070

2N5296 Q2

2N5296 Q4

2N5296 Q1

2N5296 Q3

R2 220Ω

R3 220Ω

R1 1.6Ω

TP DM FREQ.

R5 220Ω

R4 220Ω

R9 1K

R6 1K

R10 470Ω 1W

+12.5V

R7 1K

R8 1K

+12.5V

R15 10K

+12V

R32 20Ω 4W

4Ø IC5 SAA1027 DRUM MOTOR

IR

R31 10K

+12.5V

LOCATING PIN

J203-L +10V WHT

J203-5 +5V BLK

(FM CAL) Q5 COL. R27 10K RED

J203-N GRN

R33 18Ω 2W +13.3V

+21V YEL

+10V LS MTR BLU

J203-P BRN

R30 ORN

J203-15 GRY

+10

J203-16 WHT/BLK

J203-18 WHT/RED

SOUND

P201

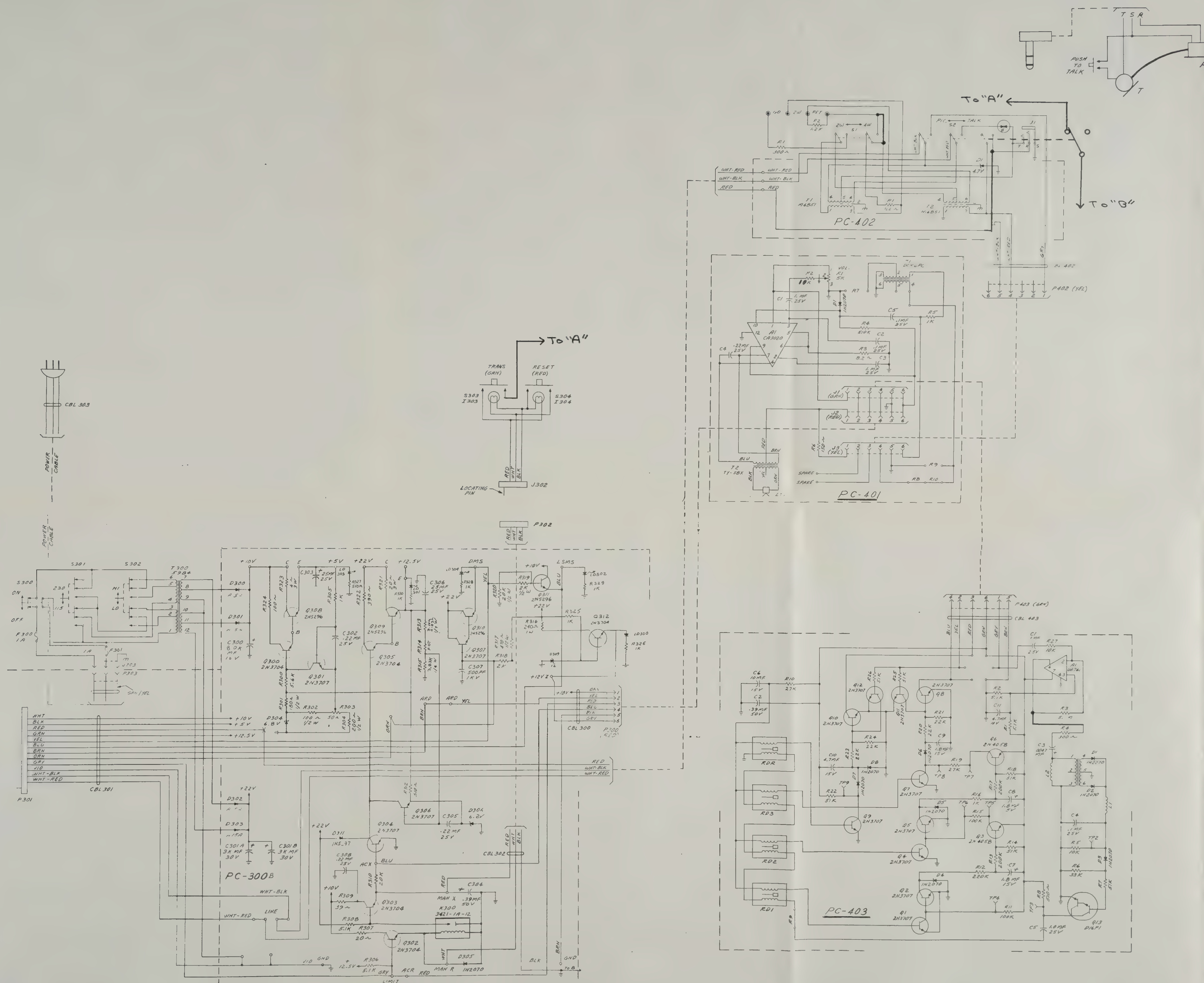


FIG. 19

SYSTEM SCHEMATIC PART B
TELEPHOTO SCANNER TYPE 16-S-D F/2
UNITED PRESS INTERNATIONAL

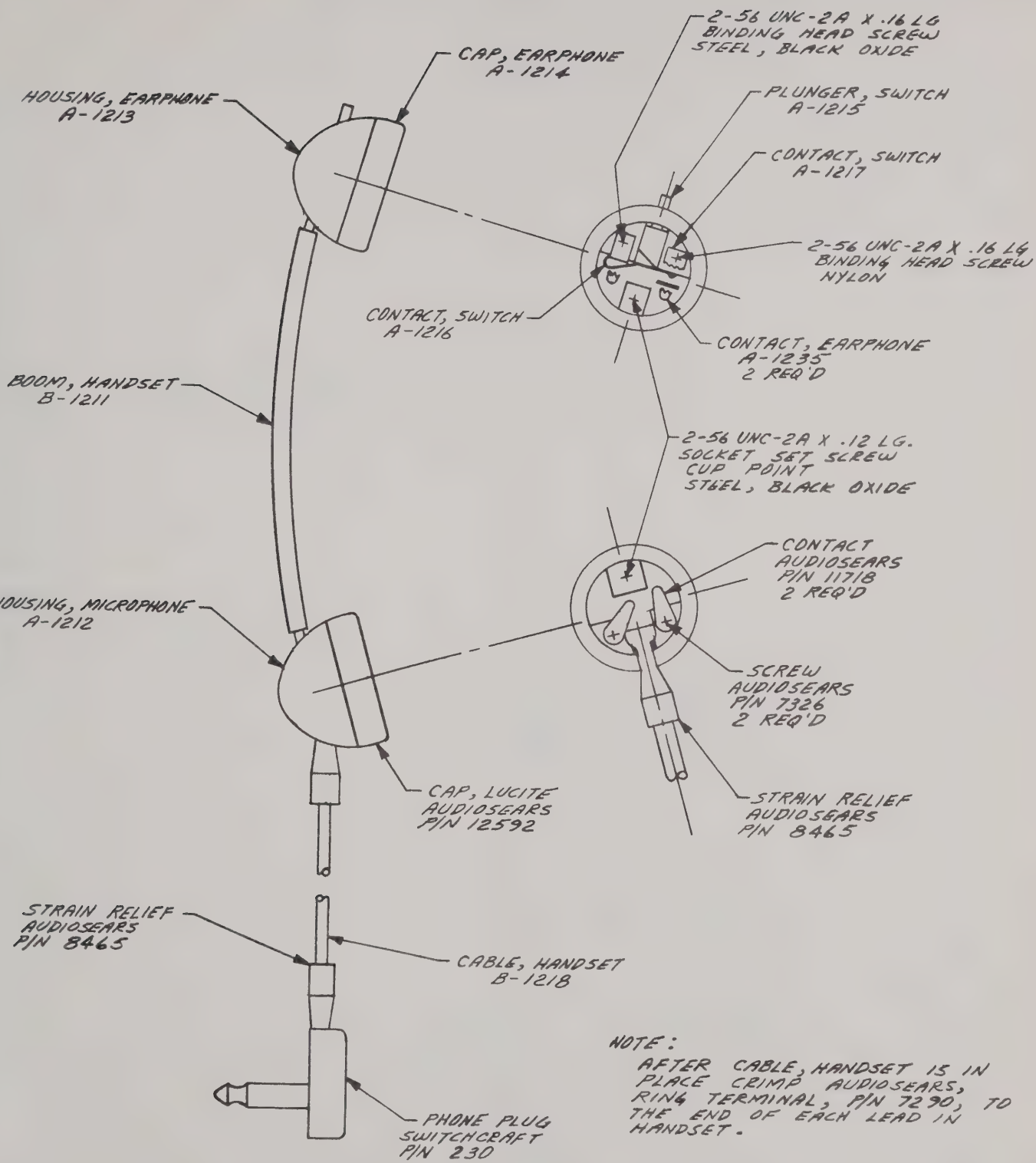

2-56 UNC-2A X .16 LG
BINDING HEAD SCREW
STEEL, BLACK OXIDE
CAP, EARPHONE
A-1214
HOUSING, EARPHONE
A-1213
PLUNGER, SWITCH
A-1215
CONTACT, SWITCH
A-1217
2-56 UNC-2A X .16 LG
BINDING HEAD SCREW
NYLON
CONTACT, SWITCH
A-1216
CONTACT, EARPHONE
A-1235
2 REQ'D
BOOM, HANDSET
B-1211
2-56 UNC-2A X .12 LG.
SOCKET SET SCREW
CUP POINT
STEEL, BLACK OXIDE
CONTACT
AUDIOSEARS
P/N 11718
2 REQ'D
HOUSING, MICROPHONE
A-1212
SCREW
AUDIOSEARS
P/N 7326
2 REQ'D
CAP, LUCITE
AUDIOSEARS
P/N 12592
STRAIN RELIEF
AUDIOSEARS
P/N 8465
STRAIN RELIEF
AUDIOSEARS
P/N 8465
CABLE, HANDSET
B-1218
PHONE PLUG
SWITCHCRAFT
P/N 230
NOTE:
AFTER CABLE, HANDSET IS IN
PLACE CRIMP AUDIOSEARS,
RING TERMINAL, P/N 7290, TO
THE END OF EACH LEAD IN
HANDSET.

FIG. 20

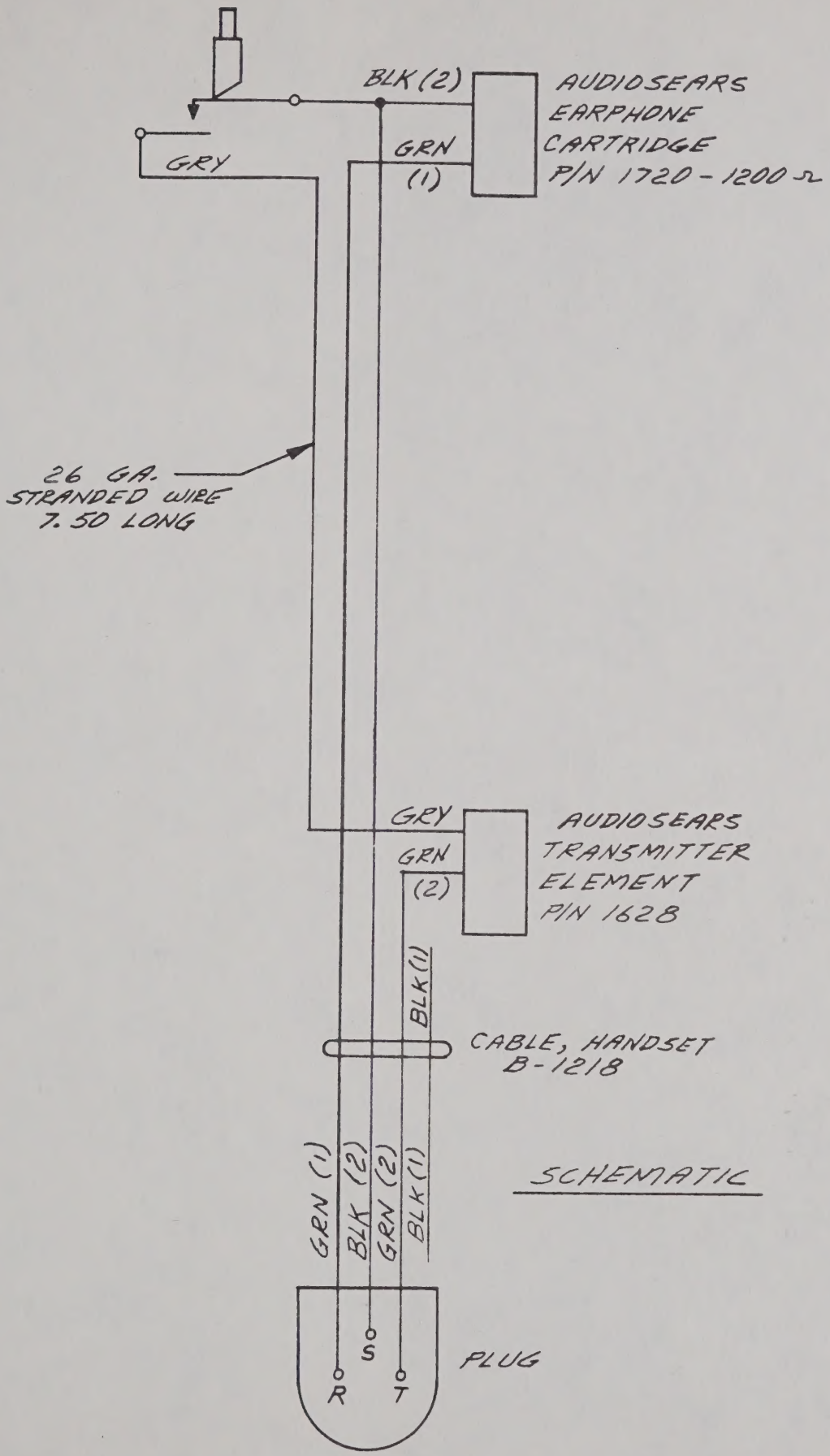


FIG.21

REQUIRED

1 ASSEMBLY PER UNIT